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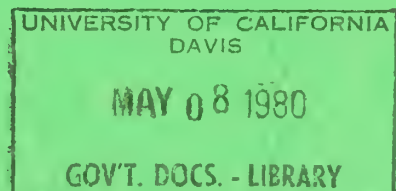
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REPORT OF THE STATE GEOLOGIST.

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JAMES F. DAVIS
STATE GEOLOGIST

SEVENTY-SECOND REPORT OF THE STATE GEOLOGIST

ACTIVITIES OF THE
CALIFORNIA DIVISION OF MINES AND GEOLOGY
JULY 1, 1978, THROUGH JUNE 30, 1979

James F. Davis, State Geologist
California Division of Mines and Geology
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FOREWORD

Those who make land-use decisions in California must accomodate the urban expansion and sound economic growth necessary to an expanding population and still enable the maintenance of an acceptable environment. The levels of understanding behind such decisions range from a broad, general knowledge of California's complex geology and mineral resources, that can lead to policy decisions, to site-specific details on geology and resources that are necessary for various approval processes.

To facilitate those broad and specific processes, the California Division of Mines and Geology (CDMG) is engaged in three information-related activities. These are: (1) information collection, which includes geologic research and applied geologic investigations; (2) advisory services activities to the local, State, and federal agencies on such matters as environmental impact, outer continental shelf development, critical facilities design, mined land reclamation, and mineral resources potential; and (3) information distribution, which includes District information services, both oral and written, publication of CALIFORNIA GEOLOGY, a monthly magazine, and publication of reports on geologic research and applied geologic investigations. Many of the Division's disciplinary programs cross through all of these information activities.

For example, the Division conducts statewide and local programs for identification, reduction, and mitigation of seismic and other geologic hazards, to minimize loss of life and damage to property. These activities include the fault evaluation and zoning (Alquist-Priolo) program, the earthquake hazard reduction program, the Strong Motion Instrumentation Program, and the site evaluation and review program. The Division also conducts a vital program, mandated by the Surface Mining and Reclamation Act of 1975 (SMARA), that involves the identification of mineral resources before urban development has precluded resource development. In addition, the Division develops basic geologic data with its regional mapping program.

The Division's efforts , moreover, continue to encourage the recognition that fundamental geologic knowledge bears on the economic well-being and safety of the citizens of California.

HIGHLIGHTS OF FISCAL YEAR 1978-79

During the first full year of his administration, the State Geologist, Dr. James F. Davis, placed the Division on a quarterly management basis. Preceding each quarter, or during the early part of each quarter, a Quarterly Management Meeting is held to establish program and project goals for the quarter and to review program performance for the quarter just ended. As part of the quarterly management process, allocations of staff time to programs and projects are made and measurable program and project objectives are identified and established. Division Headquarters administrative staff, program managers, and District Geologists constitute the management team involved in the quarterly meetings.

Division Headquarters staff was reorganized to divide administrative responsibilities in a more workable fashion. In this process, an Advisory Services unit was created with the responsibility, under the Advisory Services Office, for all review activities.

During the fiscal year 1978-79, the Strong Motion Instrumentation activity, operated by the Office of Strong Motion Studies from Sacramento, Bakersfield, and San Bernardino, completed seven years of operation.

A cooperative agreement with the U.S. Department of Transportation was initiated in July 1978 to instrument the Caldecott Tunnel. The Strong Motion Instrumentation Committee of the Seismic Safety Commission assembled a list of nominations from various organizations and agencies for instrumentation that included 54 buildings, 49 transportation facilities, 30 dams and 17 lifeline facilities such as power plants, water treatment plants and water transmission/storage structures.

Instrumentation activity during the year included the installation of nine freefield stations and the abandonment of five, for a net gain of five stations with a total of 15 seismic data traces. Six buildings instrumented with a total of 73 seismic data channels, and one dam with nine seismic data channels were added to the system. At the end of the 1978-79 fiscal year, a total of 339 permanent and nine temporary freefield stations representing 1044 seismic data channels, 41 buildings representing 499 data channels, 16 dams representing 186 data channels, and three bridges representing 58 data channels were installed and operating in the program.

The Advisory Services group completed a major review responsibility with respect to the proposed Auburn dam. The review "task force," created in 1977, carefully considered the U.S. Bureau of Reclamation project geology report on the dam site as well as the reports of Woodward-Clyde Consultants. Subsequently, the task force considered the issues on five key subjects: (1) the Maidu East fault; (2) the potential for reservoir-induced seismicity; (3) the maximum credible earthquake and peak ground accelerations; (4) the potential for surface displacement associated with faulting; and (5) the recency of surface faulting.

A preliminary report, "Technical Review of the Seismic Safety of the Auburn Damsite," was part of the CDMG presentation made to the State's Consulting Board for Earthquake Analysis of Auburn Dam, at its second meeting, held November 20-22, 1978.

Finally, after review of the Consulting Board's position that the potential for fault offset in the dam foundation was five inches, a recommendation was made that an appropriately conservative design parameter, as opposed to the maximum displacement that could occur throughout all time, was nine inches of offset in the foundation. This recommendation, together with the Board's report and recommendations on design parameters, was transmitted to the Secretary of the Interior on March 6, 1979 as a part of the State's position on the seismic loading parameters for the Auburn site.

A copy of a preprint version of the Division's final report was sent to the Secretary of the Interior on June 22, 1979. The final printed version will be released early in fiscal year 1979-80 as Special Publication 54, "Technical Review of the Seismic Safety of the Auburn Damsite, May 1979."

In the Division's regional mapping program, the Sacramento 1° x 2° quadrangle was completed in draft form for review and format decisions. This is the first in the new, 1:250,000 Regional Geologic Map series depicting formational units.

The Division is involved in coordinating the California part of a project to develop sets of columnar stratigraphic sections representative of the geology within the many geologic provinces of the United States. The project, sponsored by the American Association of Petroleum Geologists, is called the Correlation of Stratigraphic Sections of North America (COSUNA).

DIVISION PROGRAMS

The Division's programs provide technical data to assist public agencies and the private sector in the wise and safe use of the earth's crust, its terrain, and its mineral resources. The overall objective is to identify and provide timely delineation of geologic hazards and to identify, delineate and assist in the ultimate utilization of deposits of minerals, both onshore and offshore, consistent with wise conservation practices.

Potentially hazardous geologic conditions must be identified prior to land development in order to protect the public from possible economic loss and injury. These hazards include landsliding, ground rupturing caused by fault movements, ground shaking caused by earthquakes, tsunamis (seismic sea waves), volcanic eruptions, land subsidence, expansive soils, and erosion. Deposits of mineral raw materials must be identified and delineated so action can be taken to prevent their loss to urban encroachment.

The following programs deal with environmental concerns and economic mineral resources.

I. Geologic Hazards Program

Division activities directly concerned with geologic hazards are: (1) active fault evaluation and delineation as required by the Alquist-Priolo Special Studies Zones Act; (2) cooperative studies with the U.S. Geological Survey under its Earthquake Hazard Reduction Program; (3) cooperative agreements with local government to identify geologic hazards; (4) installation, maintenance, and operation of strong motion instruments to provide data for earthquake resistant building design; (5) review of geologic/seismic reports on hospital, power plant, and dam sites, and of environmental impact reports, and (6) geology as it relates to forest management.

1. Active fault evaluation

The Division's active fault evaluation and zoning program was established by the Alquist-Priolo Special Studies Zone Act of 1972 (Chapter 7.5, Public Resources Code). The objective of the law is to provide for the public safety from surface rupture in hazardous fault zones by restricting construction astride active fault breaks. Under the Act, the State Geologist delineates special studies zones about one-quarter mile wide along potentially hazardous faults, starting with the State's four major faults: the San Andreas, the Calaveras, the Hayward, and the San Jacinto. Under guidelines adopted by the State Mining and Geology Board, local governments permit certain development projects in the special studies zones only after geologic study shows building sites to be free of hazardous faults.

During 1973, the first year of the program, special studies zones for the four major active faults were delineated on 175 7.5-minute quadrangle

maps (scale one inch equals 2000 feet). After public review, these maps were officially issued on 1 July 1974. An additional 92 new zone maps and 15 revised zone maps were issued by the end of the 1978-79 fiscal year (see Table 1).

Table 1. Official Maps of Special Studies Zones issued as of 30 June 1979.

<u>Date of issue</u>	<u>New maps</u>	<u>Revised maps</u>
1 July 1974	175	_____
1 January 1976	81	5
1 January 1977	4	3
1 January 1978	1	_____
26 July 1978	2	_____
1 January 1979	<u>4</u>	<u>7</u>
Totals	267	15

Although the initial zoning was based on available data for the four major faults, the 1974-75 zoning efforts demonstrated that reliance could not be based solely on the work of others. The Division clearly needed to rely more heavily on observations by Division staff, both in the field and by use of aerial photographs. Thus, a 10-year fault-mapping and evaluation program was initiated in 1976 to consider the many other potentially active faults for possible zoning. Under this program, potentially active faults not previously zoned are being evaluated for zone revisions when warranted by new information. The terms "sufficiently active and well-defined" (PRC Sec. 2622) were defined to serve as specific criteria by which zoning decisions are made.

The 1978 area (Figure 1) is the third area to be evaluated under the 10-year program. These studies, conducted between May 1978 and May 1979, resulted in the completion of 19 fault evaluation reports (FERs) that evaluate recently active strands of the Elsinore, the San Andreas, the San Jacinto, the Rose Canyon, and other faults in southern California. As a consequence, recommendations were made to establish 30 new and revised zone maps. Preliminary Review Maps of the new and revised zones were issued on 1 July 1979, with the plan to issue Official Maps on 1 January 1980.

A summary report of the 1978 work area is available as Open-file Report OFR 79-10 SF. Previous summary reports also are available for the 1976 and 1977 work areas. The fault evaluation reports are in-house reports, many of which contain new and original data. The FERs for the 1978 work area, written by Drew P. Smith, Richard B. Saul, and Earl W. Hart, may be consulted at the San Francisco and Los Angeles District offices.

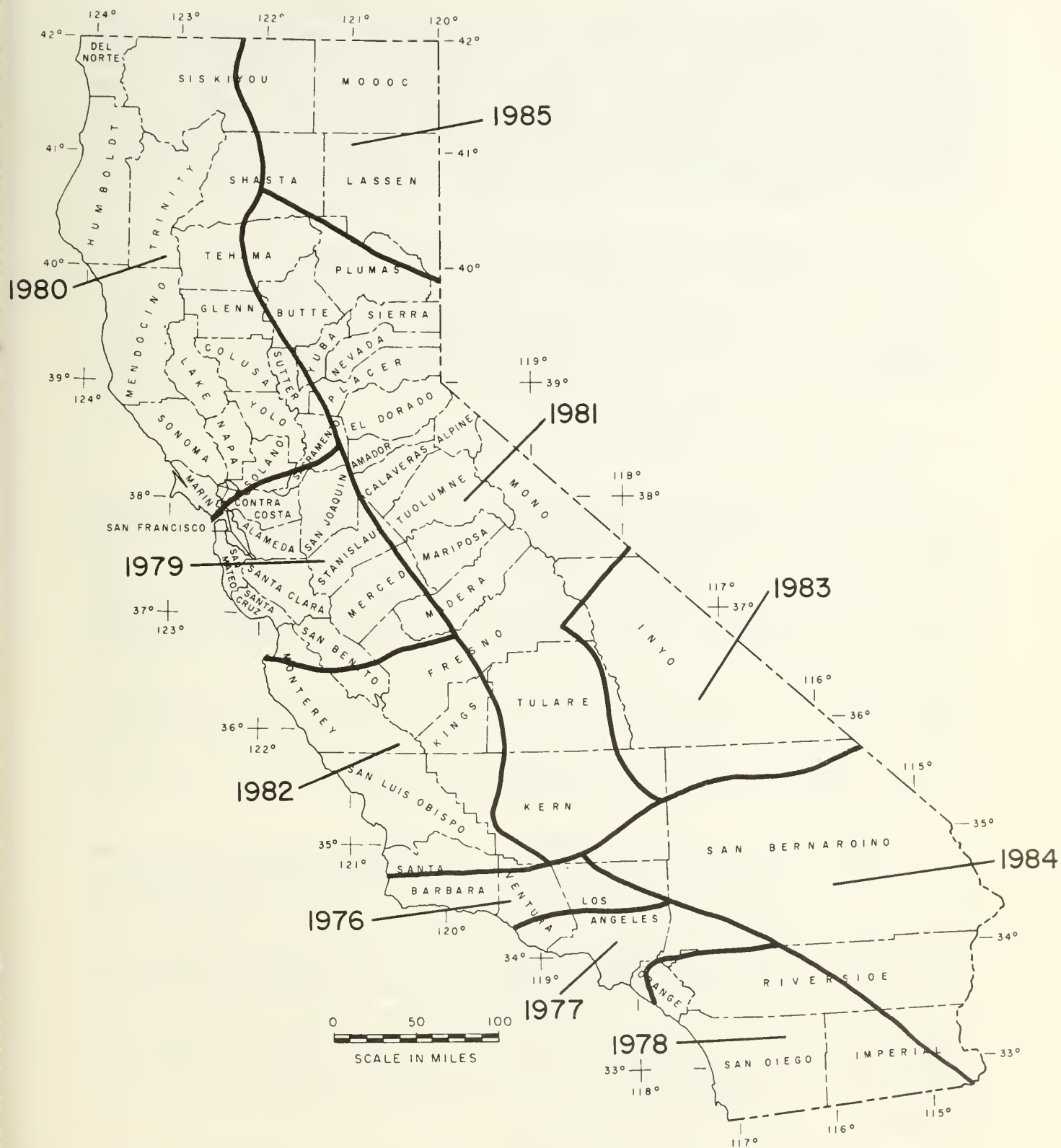


Figure 1. Fault evaluation work-plan schedule under Alquist-Priolo Special Studies Zones Act.

Other functions of the Division under the Alquist-Priolo Special Studies Zones Act include (1) the filing of geologic reports for development sites within the special studies zones and (2) review of waiver requests in lieu of a geologic report (PRC, Sec. 2623). By the end of the 1978-79 fiscal year, a total of 980 geologic reports were on file and available for reference at the San Francisco District office. An index map, Open-file Report OFR 76-6 SF (revised yearly), identifies all the sites investigated for faults under the Act. Fifteen waiver requests, all from Riverside County, were processed during the year.

The Division's fault evaluation and zoning activities, as well as other aspects of the Alquist-Priolo Special Studies Zones Act, were summarized in the paper, "Zoning for the hazard of surface fault rupture in California," by Earl W. Hart (published in the Proceedings of the Second Annual Conference on Microzonation, San Francisco, California, p. 635-646). Supplements updating the 1977 editions of Special Publication 42, "Fault Hazard Zones in California," also were issued during the year.

2. Cooperative studies with the United States Geological Survey

Since 1972, the California Division of Mines and Geology (CDMG) has participated in cooperative studies with the U.S. Geological Survey (USGS) funded through the Survey's Earthquake Hazard Reduction Program. Even though national competition for these funds has been high, earth scientists from the Division have submitted a total of 25 successful proposals thus far through this program. These studies have generated much new, basic information necessary for understanding the earthquake hazard in California and for improving public safety.

The USGS supported studies that were carried on by the Division in fiscal year 1978-79 span two successive federal contract years. This has occurred because the State and Federal fiscal years are out of synchronization by three months and because the starting dates on individual CDMG-USGS cooperative projects vary from year to year.

In fiscal year 1978-79, the Division completed investigations on the seven research proposals which received awards from the USGS in fiscal year 1977-78. Five of the studies were area specific: (1) the San Andreas fault in northern Los Angeles County, (2) faulting offshore from metropolitan San Diego, (3) the Santa Monica-Raymond Hill fault zone through the urban Los Angeles Basin, (4) the northwestern two-thirds of the San Gabriel fault zone in Los Angeles and Ventura Counties, and (5) seismic ground response in the urban area of Orange County. The other two studies, each of which was of a regional nature and thus of State-wide significance, were (6) the earthquake catalog compilation of pre-1900 California earthquake history and (7) a study to test the feasibility of using preferential coiling directions in foraminifera to establish a base-line, age-dating technique for young marine sediments.

Five new Division proposals were accepted for funding by the USGS in fiscal year 1978-79. These studies are continuations or extensions of past

multi-year investigations. They are: (1) mapping the San Andreas fault zone in northern Los Angeles County, (2) analysis of faulting offshore from metropolitan San Diego, (3) mapping the Santa Monica-Raymond Hill fault zone and the Verdugo-Eagle Rock-Benedict Canyon fault zone through the urban Los Angeles Basin, (4) seismic ground response in the urban portion of Orange County, and (5) continuation of the earthquake catalog effort on pre-1900 California earthquake history. With the exception of the offshore faulting study, which started in the fiscal year, the starting dates for these projects all fall in fiscal year 1979-80. The five new proposals received a total award of \$324,000 from the USGS.

Specific Projects - Status and Staff Assigned

Project	Status (Funding award year)	Staff
San Andreas fault zone: Valyermo segment	Project complete. Geologic map released as Open-file Report 79-1 LA (1977-78).	Barrows
San Andreas fault zone: Lake Hughes segment	Project complete. Geologic map released as Open-file Report 79-2 LA (1977-78).	Beeby
San Andreas fault zone: east half Quail Lake segment west half Three Points segment	Field work completed Office work in progress (1977-78).	Kahle
Santa Monica-Raymond Hill fault zone	Annual Technical Report sent to USGS April 1979. Contract extended. Work continuing (1977-78).	Hill, Weber, and others
Northwestern 2/3 San Gabriel fault zone, Los Angeles and Ventura Counties	Project Complete. Annual Technical Report sent to USGS January 1979 (1977-78).	Weber
Orange County seismic ground response	Project complete. Annual Technical Report sent to USGS May 1979 (1977-78).	Sprotte and Fuller
Pre-1900 Earthquake Catalog	Project complete. Annual Technical Report sent to USGS February 1979 and released as Open-file Report 79-6 SAC (1977-78).	Toppozada, Real, Bezore, and Parke

Marine sediments stratigraphic framework	Project complete. Annual Technical Report sent to USGS June 1979. Released as Open-file Report 79-11 SF (1977-78).	Kilbourne
San Andreas fault zone: east half Three Points and Pine Canyon segments	Award received. Project to begin 7/1/79 (1978-79).	Barrows and Kahle
Faulting offshore from metropolitan San Diego	Semi-annual Technical Report sent to USGS April 1979. Field and Office work continuing (1978-79).	Kennedy
Santa Monica-Raymond Hill fault zone, and Verdugo- Eagle Rock-Benedict Canyon fault zone	Award received. Project to begin 7/10/79 (1978-79).	Weber, Hill, and others
Orange County seismic ground response	Award received. Project to begin 9/18/79 (1978-79).	Sprotte, Fuller, and Greenwood
Pre-1900 Earthquake Catalog; isoseismal maps and summary of reported effects	Award received. Project to begin 7/1/79 (1978-79).	Topozada, Real, Bezore, and Parke

3. Cooperative studies with county and local governments

The Division conducts a number of geological studies in cooperation with local government and other State agencies to provide technical information about actual or potential areas of geologic hazard and mineral resources. Some of the studies demonstrate the need for, and the usefulness of, geologic information to local government planning, building, and public works agencies. Cooperative activities are funded jointly by the Division and the cooperating agency under various arrangements, the nature of which depends upon the availability of funds and personnel, the relative urgency of the project to the State and to the cooperating agencies, and other factors. Cooperative activities with counties were either suspended or reduced owing to changed budgetary conditions of both counties and State after July 1, 1978.

a. Los Angeles County

No funds were provided by the Department of the County Engineer and the Los Angeles County Flood Control District for continued work to accelerate

the Division's geologic studies in the County. Work continued, on a reduced basis, on projects initiated under previous funding arrangements.

The Los Angeles Department of the County Engineer also was unable to provide funds to accelerate the Division's cooperative fault hazards study with the USGS (Earthquake Hazard Reduction Program) in the San Andreas fault zone in the northern portion of the County. Work continued, however, on a reduced basis.

b. Orange County

No funds were provided by the Orange County Environmental Management Agency (Department of Building and Safety, Road Department, and Orange County Flood Control District) for continued work to accelerate the Division's geologic studies in the County. Work continued, on a reduced basis, on projects initiated and well-advanced under previous funding arrangements.

c. Santa Clara County

Field work was completed and the preliminary report and interpretative maps for the Tar Creek South study area (formerly identified as the Sargent Ranch area) were submitted to the county and Division management for review and final approval for release to the county. No new cooperative agreements between the county and the Division are being considered at this time.

d. Sonoma County

The preliminary report and maps for the slope stability and surface fault rupture study in the Chalk Hill Road study area were completed and being reviewed by Division management. The final report and maps are expected to be completed and delivered to the county early in the next fiscal year.

Specific Projects - Status and Staff Assigned

Project	Status	Staff
	(see notes for funding arrangements)	
Black Star Cyn quadrangle, west part	Field mapping in progress on reduced time basis. (3)	Tan and Miller
Calabazas quadrangle, southwest quarter and Thousand Oaks quadrangle, southeast quarter	Report being prepared for open-file release (OFR 77-7 LA) and printing.(1)	Weber
Chalk Hill Road area	See Sonoma County.	
El Toro quadrangle, north half	First draft in District review. (3)	Tan, Miller, and Fife*

Glendora quadrangle, south half and Mt. Baldy quadrangle, southwest quarter	Report being revised after Headquarters review. (3)	Streitz
Juniper Hills quadrangle	Revised report completed and reviewed; revisions in accord with additional reviews nearly complete.(1)	Barrows
La Habra, Yorba Linda, and Prado Dam quadrangles	Revised 1st draft for District review. (3)	Tan and Miller
Mint Canyon quadrangle, south half	Revising report of SW/4 and combining with SE/4 to make one report on S/2. Recessed during 1978-79.(1)	Saul
Mt. Baldy quadrangle, southwest quarter	See Glendora quadrangle.	
Newhall quadrangle, northeast quarter	Report being revised after District review of 1st draft. Recessed during 1978-79. (1)	Smith
Newhall quadrangle, southeast quarter	Field mapping continued on reduced time basis. (1)	Treiman
Oat Mt. quadrangle, southeastern part	In publication processing. Map scribed; to Heintz for watercote; to be printed as Map Sheet 30.	Saul
Oat Mt. quadrangle, southwestern part	Printed: Map Sheet 33 released. (1)	Evans* and Miller
Orange County, Geo-environmental report	Revised report text complete. Plates being drafted for open-file release and printing. (3)	Morton and Miller
Orange County, Recency of faulting study	Text and maps being revised in accord with 2nd draft review. (3)	Miller and Tan
Pasadena quadrangle, north part	Mapping completed; 1st draft nearly completed. Recessed during 1978-79.	Smith
Prado Dam quadrangle	See La Habra quadrangle.	

San Andreas fault zone, Lake Hughes segment	Report issued as Open- file Report 79-2 LA. (2)	Beeby
San Andreas fault zone, Leona Valley segment	Open-file release (OFR 77-2 LA) in preparation for publication. (2)	Kahle, Smith, and Beeby
San Andreas fault zone, Palmdale segment	Open-file release (OFR 76-6 LA) in preparation for publication. (2)	Barrows, Kahle, and Beeby
San Andreas fault zone, Quail Lake to Three Points segment	Report being prepared for open-file release (OFR 79-3 LA). (2)	Kahle
San Andreas fault zone, Valyermo segment	Report issued as open- file report (OFR 79-1 LA). (2)	Barrows
Santa Clara County Sargent Ranch area, now identified as Tar Creek South study area	Field work completed. Preliminary maps and report being reviewed by County and Division.	Armstrong
Santiago Peak quadrangle, southwest quarter and part of northwest quarter	First draft of report completed. (3)	Miller and Morton
Sargent Ranch area	See Santa Clara County	
Sonoma County, Chalk Hill Road area	Field work completed. Preliminary report and maps being reviewed by County and Division. (4)	Armstrong
Sonoma County, county-wide study to assist in pre- paration of general plan elements	To be published as Special Report 120.(4)	Huffman and Armstrong
Tar Creek South study area	See Santa Clara County.	
Thousand Oaks quadrangle	See Calabasas quadrangle.	
Ventura County seismic hazards study	Open-file release (OFR 76-5 LA) being processed for publication.	Weber, Sprotte, Kiessling, Cleveland, Johnson*, and Sherburne
Yorba Linda quadrangle	See La Habra quadrangle.	

Notes:

*Geologist formerly with the Division.

1. Funding initially provided by Los Angeles County Engineer and Flood Control District not continued 1978-79.
2. Funding initially provided by Los Angeles County Engineer to accelerate USGS funded projects not continued 1978-79.
3. Funding initially provided by Orange County not continued 1978-79.
4. No funds provided 1978-79.

4. Strong-motion instrumentation program

One of the primary problems confronting structural engineers in their efforts to design earthquake-resistant structures is the lack of knowledge regarding the force of ground motion and the deformation induced in structures and facilities by earthquake-generated ground motion. In late 1971, Chapter 8 of Division 2 of the Public Resources Code (SB 1374) was signed into law to establish a Strong Motion Instrumentation Program (SMIP). The California Division of Mines and Geology was designated as the responsible managing agency.

The Division is installing, maintaining, and monitoring a network of strong-motion instruments to study the nature of strong earthquake motion and to collect data for the design of earthquake resistant buildings. This activity is supported by a special fund derived from a fee on all construction permits issued by cities and counties.

The SMIP objective is to obtain statewide detailed records of the response of rock and soil units and of engineered structures to ground motion generated by earthquakes. The accelerometer, an instrument that measures the force-generating properties of seismic waves, is used to record these data.

a



b



Photo 1a. Strong-motion instrument: triaxial accelerograph. After a seismic event has triggered the recorder, the photographic record of the event is retrieved. The black canister to the right of the accelerograph contains the photographic record of the event.

Photo 1b. Fiberglass enclosure housing a free-field triaxial accelerograph.
(Photos by T.M. Wootton.)

During the fiscal year 1978-79, the Strong Motion Instrumentation activity, operated by the Office of Strong Motion Studies from Sacramento, Bakersfield, and San Bernardino, completed seven years of operation.

A cooperative agreement with the U.S. Department of Transportation was initiated in July 1978 to instrument the Caldecott Tunnel. This proposal is to monitor the tunnel with a nineteen-channel, digital recording system, with thirteen data channels recording tunnel response and six data channels recording freefield response (three data channels are to be placed in the subsurface at tunnel grade). Proposed completion of the project is in the 1979-80 fiscal year with 75 percent of the estimated costs paid by the federal government and 25 percent by the State. Additionally, a project to instrument the Vincent Thomas Bridge has been proposed as a three-way cooperative effort by the U.S. Department of Transportation, the U.S. Geological Survey, and the California Division of Mines and Geology. Active planning for this project is anticipated in fiscal year 1979-80.

The buildings, transportation facilities, and lifeline elements to be used as ground response sites in the program were selected with the advice and assistance of the Strong Motion Instrumentation Committee of the Seismic Safety Commission. The Committee encouraged a variety of organizations and agencies to nominate sites and structures for instrumentation. In this way, the Committee put together a list of nominations for instrumentation that included 54 buildings, 49 transportation facilities, 30 dams and 17 lifeline facilities such as power plants, water treatment plants and water transmission/storage structures. Additional lists of approximately 350 buildings and 30 lifeline facilities are to be generated during the development of the program.

Instrumentation activity during the year included the installation of nine freefield stations and the abandonment of five, for a net gain of five stations with a total of 15 seismic data traces. Six buildings were instrumented with a total of 73 seismic data channels, and one dam with nine seismic data channels were added to the system. At the end of the 1978-79 fiscal year, a total of 339 permanent and nine temporary freefield stations representing 1044 seismic data channels, 41 buildings representing 499 data channels, 16 dams representing 186 data channels, and three bridges representing 58 data channels were installed and operating in the program.

A Data Management function is an important addition to the SMIP activity; ultimately, it will be able to process and disseminate strong-motion data to user communities. Initial steps to develop this data-processing capability were taken immediately after the authority and mandate to do so were provided by the adoption of Chapter 1243, Statutes of 1976, on January 1, 1977. Work has been completed on a preliminary, departmental Feasibility Study Report (FSR), which is required by the State Department of Finance before any significant funds can be spent for data-processing activities. The FSR has been conditionally approved, and funding in the amount of \$215,000 for project initiation has been requested. A proposal to be investigated in the coming year is the adaptation of an existing digitizing and computing system now in use at the University of Southern California.

During the fiscal year, the Program operated in accordance with the functional organizational chart (Figure 2). The Program was budgeted at \$851,526 for the year, excluding a federal contract for \$48,000. Actual expenses totaled \$880,296 with revenues of \$1,047,183, resulting in a net gain to the Strong Motion Instrumentation fund of \$166,887.

5. Advisory Services - geologic/seismic review

Eleven staff members were assigned to the Advisory Services Group. Of these, three geologists were assigned to the Department of Forestry on a full time basis to review timber harvest plans and to perform studies under the 208 and Title II programs. The other eight, including one seismologist, were assigned to activities involving the Energy Commission, the Coastal Commission, Auburn dam, Warm Springs dam, the Nuclear Regulatory Commission, Point Conception LNG, hospital sites, Environmental Impact Reports (EIR), Alquist-Priolo waivers, and reclamation plan reviews. Reimbursements for Energy Commission, Department of Forestry, Coastal Commission, PUC-LNG project, and hospital site review services amounted to 7 man-years out of the total 11 man-years assigned to the Advisory Services Group. For the following fiscal year, it is expected that work with the Energy Commission will decrease due to lack of new nuclear projects, but that additional work is to be obtained from the Coastal Commission for studies relating to outer continental shelf critical facilities siting along the coast.

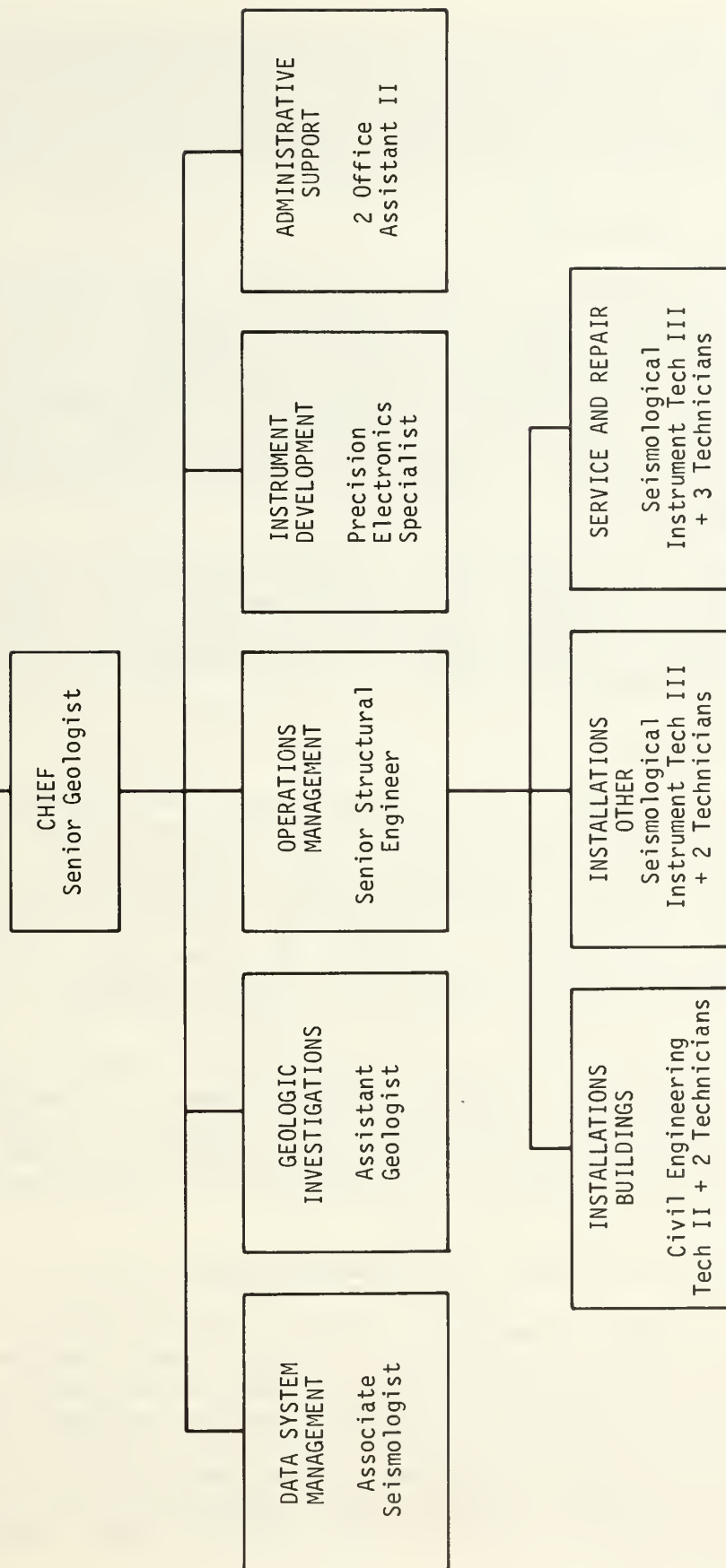
a. Coastal zone developments

A contract with the Coastal Commission provides for Division staff to review the geologic and seismic safety of proposed developments when requested by the Commission. Reimbursement is on a case-by-case basis, and Division review requires a site visit as part of the engineering geologic appraisal. Most of the work is in southern California, where intensive development is occurring in areas of potentially unstable sea cliffs.



Photo 2. Seacliff retreat in Capitola area. The coastal zone is one of the most dynamic environments in California. This seacliff in the Purisima Formation is jointed and erodible. Severe cliff retreat has undercut the foundations of buildings along the coast in the Capitola area. Erosion processes should be a consideration in land-use plans. (Photo by G.B. Griggs.)

SPECIAL PROGRAMS OFFICER



Tom M. Wootton

Tom M. Wootton, Chief, OSMS

March 9, 1979

Figure 2. Operating structure, Office of Strong Motion Studies.

During the previous fiscal year, the Division reviewed the liquefied natural gas (LNG) facility problem for the Coastal Commission. However, legislation was passed which transferred the authority to locate an LNG site to the California Public Utilities Commission (PUC). The Division continued its involvement in LNG siting with the PUC as described below.

b. Environmental Impact Reports

The Division continued to review Environmental Impact Reports (EIRs) in 1978-79; approximately 600 reports were processed by the staff. The EIRs reviewed covered a variety of projects, including sites for power plant facilities, petro-chemical facilities, subdivisions, school sites, mining activity, and dam sites. The problems of earthquake shaking, fault rupture, landsliding, erosion, expansive soil, tsunami, subsidence, volcanic eruption, mineral resource conservation, and mined-land reclamation are considered in the review, following the Division's EIR guidelines (CDMG Note 46).

The Division's staff has expended a significant amount of time in the review of federal regulations and reports relative to nuclear waste storage and disposal. Federal agencies providing documents for review included the Nuclear Regulatory Commission, the Department of Energy, and the Environmental Protection Agency.

c. Hospital site reports

The Division continued to review reports under the provisions of the Hospital Safety Act (Health and Safety Code), which became effective March 7, 1973. This Act requires that new hospitals, including additions, reconstructions, and out-patient facilities be functional during and after an earthquake or other natural disaster. During fiscal year 1978-79, the Division reviewed 51 new and supplemental geologic/seismic hospital site reports that were submitted by consulting engineering geology firms to the Office of the State Architect.

Recent Legislation requires the Department of Health, with the approval of the State Building Safety Board, to develop new administrative regulations which would provide waivers of geotechnical studies for certain non-critical structures. During the next fiscal year, the Division, as a member of the geotechnical subcommittee, will be involved in developing such regulations.

d. Power plant sites - nuclear and fossil fuel power

The Energy Resources Conservation and Development Commission (ERCDC) and California Division of Mines and Geology (CDMG) continued their contract agreement in which the CDMG provided geology and seismologic advice on geologic hazards and risks pertinent to proposed sites for fossil fuel and nuclear electrical generating plants. Also included in this effort was the review of geothermal power plant sites. In addition to the review of Notice of Intention (NOI) documents, the Division staff provided regional generic studies on historic fault rupture and earthquake recurrences.

Geologic and seismic problems at two nuclear power projects, San Onofre and Diablo Canyon, involved a significant amount of review in coordination with the Nuclear Regulatory Commission. Many geologic and seismic issues were unresolved and will continue to be actively investigated during the following fiscal year.

e. Other critical facility developments

(1) Auburn dam site

As a result of public concern over the seismic safety of the proposed U.S. Bureau of Reclamation Auburn dam, the site of which is located in the same Foothill shear zone that generated the 1975 Oroville earthquake, the Division was asked to represent the Department of Conservation in a joint effort with the Department of Water Resources (CDWR) to perform an Auburn Dam Seismic Safety Review for the State of California. To facilitate this effort, the Division created a "task force" in 1977. The members of the task force--four geologists, a soil scientist, a geophysicist, and a seismologist--had the support of laboratory and other staff members to process samples, check background materials, and do compilations. To assure coverage without overlap, the work was broken down into "mini-projects" that could be assigned to members of the task force. These projects included: (1) East Maidu fault studies; (2) fault studies outside the dam site; (3) dam site foundation excavation detail; (4) Foothill lineament studies; (5) seismicity studies; (6) induced seismicity studies; (7) geomorphic studies, and (8) the Oroville earthquake event analysis.

The Division's Auburn dam task force spent a great deal of time and effort reviewing the USBR Project Geology report on seismic evaluation of Auburn dam site, which it received September 21, 1977. In January 1978, when the final volume of the Woodward-Clyde Consultants (WCC) report was received, the task force subjected it to an equally intensive, in-depth review. Individual members of the task force produced commentaries reflecting their respective fields of expertise. In general, the Division's task force members expressed agreement with the major body of the Woodward-Clyde Consultants report and with the methods of study used to develop the information presented therein. In addition to examining the Woodward-Clyde report, the Division also reviewed and commented on all other geologic and seismologic reports which have been submitted to the Bureau.

As an outgrowth of the Division's review of the Woodward-Clyde consultants report, the Division executive staff formulated a set of five questions to be answered by the Division's Auburn dam task force. The questions covered all of the important issues raised in the Woodward-Clyde report relative to the seismic safety of the Auburn site and were developed to serve as a framework for a Division position on that subject. The questions required the Task Force to consider all the issues on these five subjects: (1) the Maidu East fault; (2) the potential for reservoir-induced seismicity; (3) the maximum credible earthquake and peak ground accelerations; (4) the potential for surface displacement associated with faulting; and (5) the recency of surface faulting.

On September 12, 1978, the USBR presented to the State copies of its report entitled "Proposed Seismic Loading Parameters for Auburn Dam." A summary table in the report listed the seismic parameters by the several investigators of record at that time, including WCC, USBR, USBR's other consultants and advisors, and the U.S. Geological Survey (USGS). The format of the USBR report and table was favorable for adoption, with minor modification, for CDMG's preliminary report, "Technical Review of the Seismic Safety of the Auburn Dam site." The preliminary report was written using information developed by all of the CDMG task force members and the State Geologist, and made extensive use of the answers to the five questions previously researched and written up by the task force members.

The preliminary report was made ready for, and was part of, the CDMG presentation made to the State's Consulting Board for Earthquake Analysis of Auburn Dam, at its second meeting, held November 20-22, 1978. When the Consulting Board's report was issued in January 1979, it was determined that all of the parameters recommended by the Board were in agreement with those developed by CDMG with the single exception of the potential for fault offset in the foundation, for which the Board had recommended five inches. CDMG then performed a painstaking reexamination of all the available data and concluded that an appropriately conservative design parameter, as opposed to the maximum displacement that could occur throughout all time, was three-quarters a foot of offset in the foundation. This recommendation, together with the Board's report and recommendations on design parameters, was transmitted to the Secretary of the Interior on March 6, 1979 as the State's position on the seismic loading parameters for the Auburn site.

Subsequently, the CDMG preliminary report was completely rewritten, using a new format that permitted condensation and elimination of duplication and at the same time presented all of CDMG's findings in a more comprehensive form. A copy of the preprint version of this report was sent to the Secretary of the Interior on June 22, 1979. The final printed version will be released early in fiscal year 1979-80 as Special Publication 54 "Technical Review of the Seismic Safety of the Auburn Dam Site."

Auburn Dam site review - staff participation

Studies	Staff
Regional and local geology	Aune, Bacon, Rice and Taylor
Soils	Borchardt
Seismicity, induced seismicity	Cramer and Topozada
Leveling surveys	Bennett

(2) Point Conception LNG site

The previous fiscal year ended with legislation transferring LNG siting authority from the Coastal Commission to the California Public Utilities Commission (PUC). Therefore, the Division's staff review of LNG siting was directed to provide technical expertise and testimony for the PUC on a contractual basis. The Division's role included the review of all

technical reports, examination of trenches, and the development of a position as to the significance of geologic and seismic findings at the Point Conception site. Division staff also reviewed the proposed LNG safety standards relating to geologic and seismic siting criteria which were developed by the Federal Energy Regulatory Administration and the PUC. The State Geologist presented both oral and written testimony on the PUC regulations during December 1978. The USGS was requested by Secretary for Resources, Huey D. Johnson, to provide its additional expertise on the potential geologic hazards at the Point Conception LNG site. Work is continuing to resolve the problems of potential fault rupture and severe ground shaking from nearby earthquakes.

(3) Vallecitos nuclear facility

During 1977, the Nuclear Regulatory Commission suspended the operations of the General Electric Test Reactor (GETR) at Vallecitos because of a possible fault rupture hazard. The CDMG was involved in all phases of the subsequent investigation of the site, including making recommendations for trenching and assessing the information obtained from the field studies. Toward the end of fiscal 1978-79, the Division established its own position as to the hazard and its significance on the GETR facility. A report on the Division's findings is to be published in August, 1979.

(4) Warm Springs dam site

The Division expended considerable resources in the review of the Warm Springs dam site. Technical review by Division staff of geologic, seismic and engineering problems, including testimony to federal court hearings, began in 1973 and is continuing. Although many geologic and seismic safety issues had been resolved, the Division staff continued to review reports and make field visits. In September 1978, the issue of a postulated landslide in the reservoir area upstream from the dam was resolved, and the only remaining significant issue, that of the bedrock stability of the right abutment, was to be clarified during the following fiscal year.

6. Advisory Services - geology and forest management

Three Division geologists advise the Department of Forestry on a full time basis. One geologist is assigned to a Department of Forestry long-term soil erosion study and a Board of Forestry water quality study mandated by Section 208 of the Federal Water Pollution Control Act. Both studies are aimed at evaluating the effectiveness of the forest practice rules for preventing soil erosion and protecting water quality during forestry activities on private land in California. The other two geologists spend most of their time on the site review of timber harvest plans. Most geologic problems in timber harvesting occur in the Coast Ranges; consequently these geologists are assigned to Eureka and Santa Rosa, respectively. A special Title II program (federal grant), which provides for basic geologic work on a regional basis, was instituted. This program will result in new geologic maps and is expected to end in fiscal 1979-80.



Photo 3. Landslides resulting from logging practices on slope of north coastal river. The concentration of water runoff from roads and sidecast from the cuts concentrated on steep slopes appears to have been the chief contributor to the debris avalanches that resulted after the winter rains. By making a preharvest inspection, a geologist can identify and evaluate potential environmental effects of logging practices in unstable geologic environments. (Photo courtesy of California Department of Forestry.)

II. Seismological/Geophysical Program

Under the Seismological/Geophysical Program during fiscal year 1978-79 the Division (1) conducted microearthquake studies and monitored earthquakes to assist in the identification of active faults and to study possible reservoir-induced seismicity; (2) developed and maintained a comprehensive, historic earthquake catalog; (3) conducted crustal movement investigations; (4) developed gravity and aeromagnetic maps and provided geophysical support for other Division projects; and (5) continued a modest program for the development of earthquake prediction techniques.

1. Monitoring seismic activity

(a) Microearthquake studies

The Division's earthquake recording capability was strengthened with the acquisition of an additional twelve channels of telemetered digital equipment. Total recording capability now consists of thirty-two channels, twenty-four digital and eight analog. These instruments are deployed for uses in various studies pertinent to the assessment of seismic risk, including (1) the identification of faults that are seismically active, (2) refinement of zones of active faulting that are being evaluated under the mandate of the Alquist-Priolo Act, (3) the study of damaging earthquake aftershocks to determine the seismic/geologic relationship of the earthquake process, and (4) the investigation of possible reservoir-related earthquake activity to better understand the potential for reservoir-induced seismicity.

An M 4.6 earthquake near Mt. Shasta on August 2 signaled the beginning of an earthquake swarm which continued to November and included very significant surface fractures. To locate and determine the significance of this activity occurring in what is known historically to be a seismically quiescent region, the Division deployed a seven-station seismic network. The earthquake activity was determined to be predominantly the result of renewed activity along an existing northward-trending normal fault located near Stephens Pass, 25 km east-northeast of Mt. Shasta. Several hundred microearthquakes within a magnitude 1 to magnitude 3 range were recorded by the CDMG network stations, which continued operation until late November and the onset of winter. Two aspects of this seismic episode were extremely significant: first, this earthquake swarm was the most pronounced seismic activity to occur in the greater Mt. Shasta region in at least the previous 25 years and, secondly, the impressive surface fractures that accompanied these relatively small earthquakes are notably uncommon.



Photo 4. Surface rupture, Stephens Pass area. The earthquake swarm which occurred August 1, 1978 near Stephens Pass, Siskiyou County, was the first seismic activity in the Mt. Shasta area within the past 25 years. Some of the earthquakes were magnitude 4. Surface rupture was discovered near Stephens Pass road in the Mt. Shasta area. Surface rupture is relatively uncommon for earthquakes of magnitude 4. (Photo by E. Leivas.)

On November 21 Division staff set off three seismic refraction shots in shallow drill holes along a 40 km line extending from 9 km southwest of Medicine Lake to 6 km northeast of McCloud. These refraction shots, recorded on 73 portable seismographs (CDMG and USGS), enabled calculation of actual crustal velocities and the travel-time calibration of the seismograph stations. This procedure permitted a more precise location of the earthquakes that occurred during this swarm.

Two digital event recorders continued in operation near New Bullards Bar Reservoir to monitor possible seismic activity along the Foothills fault system southeast of Oroville. A two-station network was operated for a brief period in the Bishop area of Inyo County following the occurrence of a M 5 earthquake; the goal of collecting high-quality, three-component seismic data in the epicentral area was achieved. The reduction, interpretation, and presentation of these data relative to the source mechanism is to begin.

During June 1979, an eight-station network of analog recorders was deployed in the San Gabriel and Verdugo Mountains, between San Fernando and Pasadena, to further investigate the seismic activity associated with the Sierra Madre and San Gabriel South fault zones. This effort is the third in a planned series of seismic studies along the major frontal faults which bound the southerly flank of the San Gabriel Mountains. Routine operation of the network stations is performed by earth science students from Los Angeles Valley College and California State University at Northridge.

(b) Earthquake monitoring

Four seismographic recorders, one located in the lobby of the Resources Building and three at the Sacramento District Office, enable both the seismology staff and the public to be aware of California's seismicity. The recorder at the Resources Building has been a most popular exhibit since its installation several years ago. The three recorders at the Sacramento District Office receive telemetered signals from permanent seismograph stations located in northern, central, and southern California. The immediate awareness of California's gross (M 4 and greater) earthquake activity that they provide helps the Division in its activities related to earthquake prediction, post-earthquake coordination functions, and the deployment of strong motion instruments.

Under a continuing agreement with the Seismological Laboratory of the California Institute of Technology, the Division provides funds for the recording and study of earthquakes in southern California. The California Institute of Technology supplies prompt notification by telephone of the location of all M 4 and greater earthquakes in southern California and monthly listings of preliminary epicenter determinations for all locatable earthquakes in southern California. Similar information is provided by the Seismographic Station of the University of California at Berkeley.

2. Earthquake Catalog

The Earthquake Catalog was used by Division seismologists to review the historical seismicity in areas surrounding critical structures such as dams and power plants, for the purpose of assessing the seismic hazard at these sites.

A catalog of information on the 42,500 California earthquakes known to have occurred during the 1900 through 1974 period has been released in the form of magnetic tape and microfiche as CDMG Special Publication 52.

For the period 1900 through 1931, before adequate statewide seismographic coverage was established, earthquakes of magnitude about 4 and greater only are included. A separate report describing these larger earthquakes that occurred from 1900 through 1931 has been published as CDMG Special Report 135. A colored 1:1,000,000-scale wall map of California showing the epicentral distribution and magnitude ranges of the larger (magnitude 4 and greater) earthquakes that occurred from 1900 through 1974, was published as CDMG Map Sheet 39. Unprecedented public demand for Map Sheet 39 necessitated reprinting two months after publication. Figure 3 shows the epicenters of more recent earthquake occurrences.

Work continued on a project funded by a grant from the U.S. Geological Survey (USGS) to research California's earthquake history for the period before 1900. The first annual report was submitted to the USGS. A proposal was submitted to the USGS to fund a third year of research into California's pre-1900 earthquake history. The proposal was accepted and will be funded for one year starting in 1980.

3. Crustal movement investigations

Remeasurements of selected lines in the State Geodimeter Network were completed to monitor horizontal deformation (strain) occurring along the San Andreas fault system. The geodimeter, a sophisticated distance measuring device utilizing laser beams, was used in the remeasurement of lines 10 to 30 km in length (a) across major faults in the north San Francisco Bay area, and (b) along a 50-km segment of the San Andreas fault between Parkfield and the Carrizo Plain in southern Monterey and San Luis Obispo Counties. Measurements in the latter area are specifically directed toward understanding of fault mechanics in this region of relatively frequent, moderate (M 5-6) earthquakes.

Utilizing the Division's short-range (> 2 km), infra-red, electronic distance-measuring (EDM) system, several surveys were completed to monitor fault creep. These included resurveys on the San Andreas fault near Cholame and in the Temblor Range in San Luis Obispo County at Camp Parks, on the Pleasanton fault in Alameda County, and on the Healdsburg-Alexander Valley fault in Sonoma County. An article describing EDM measurement techniques and providing results of some typical CDMG surveys was published in the May 1979 issue of CALIFORNIA GEOLOGY.

Geodetic leveling was completed across prominent lineaments that define the Bear Mountain branch of the Foothills fault system near the proposed Parks Bar dam site in Yuba County. Comparison of this survey (May, 1979) with a previous first-order survey by the National Geodetic Survey in 1949 revealed no evidence of any significant vertical displacement during the 30-year interval between the two surveys.

A first-order leveling survey across the Bear Mountain branch of the Foothills fault system at Auburn was completed during the previous fiscal year to evaluate crustal movement in the vicinity of the proposed Auburn dam. The results of this survey were an influencing factor in formulation of the State's recommended seismic design parameters for the

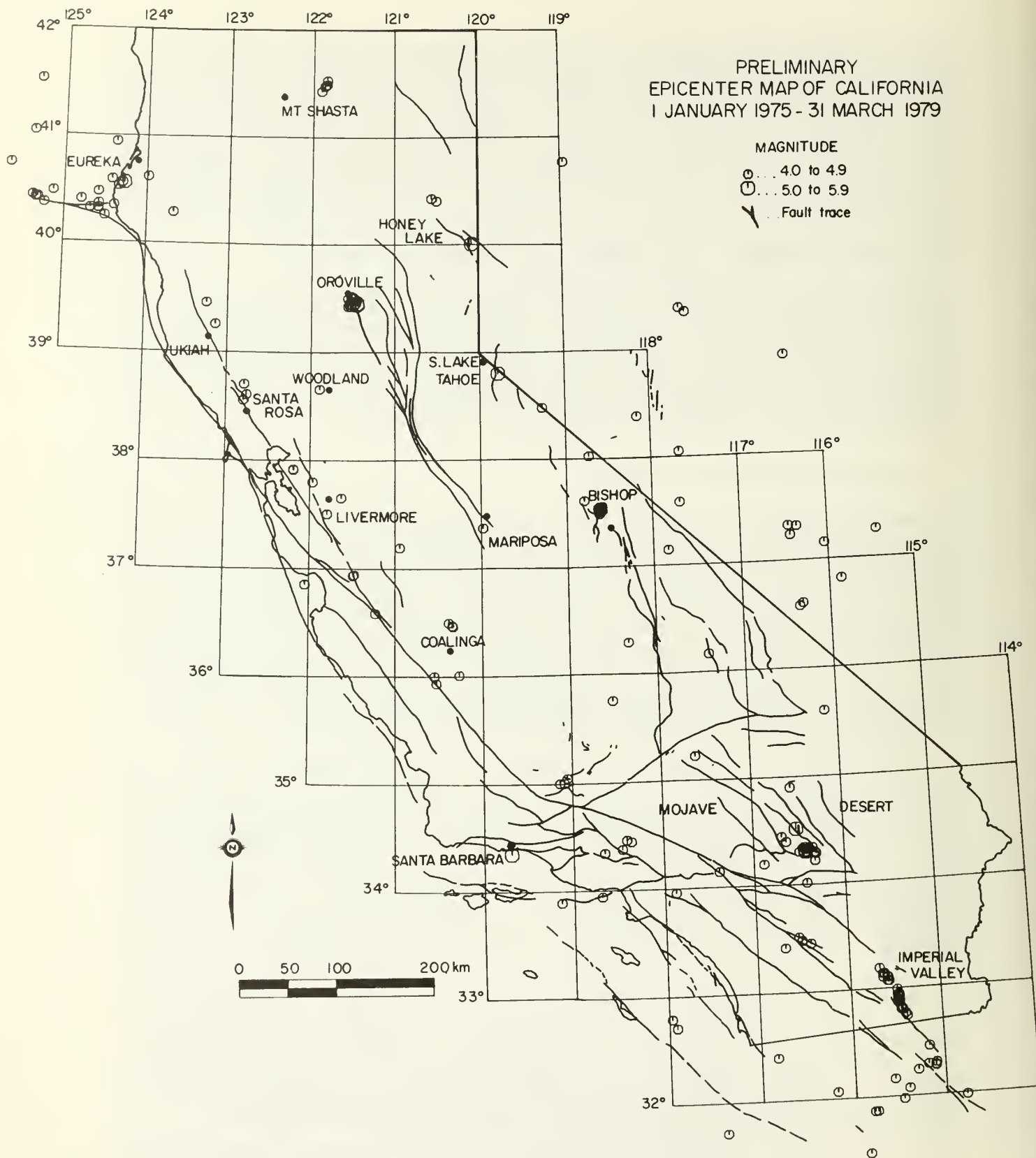


Figure 3. Epicenter locations of California earthquakes having local magnitudes 4.0 or greater that occurred during the 1 January 1975 through 31 March 1979 period. The approximate locations of Quaternary and Holocene faults are shown. Multiple earthquakes occurring at the same location are represented by a single symbol. This map supplements the information shown on Map Sheet 39.

dam. An analysis of this survey and an accompanying article describing the proposed Auburn Project were published in the August 1978 issue of CALIFORNIA GEOLOGY.

A limited program of leveling surveys was completed to monitor any post-earthquake vertical movement associated with the August 2, Stephens Pass earthquake sequence near Mt. Shasta in Siskiyou County. Repeat surveys across the fracture zone produced no evidence of any subsequent movement during the several seismically active months that followed the initial event. Surveys also were completed in support of geophysical surveys conducted for this investigation. A summary article describing the investigation of the Stephens Pass earthquake was prepared and published in the February 1979 issue of CALIFORNIA GEOLOGY.

4. Geophysical surveys

The Division conducted a number of geophysical surveys during fiscal year 1978-79. Some of these were in support of geologic projects to help define subsurface structures, and others were primarily geophysical studies. The geophysical data resulting from these studies are used principally to define fault zones, locate mineral deposits, and define favorable areas for geothermal resources.

a. Gravity maps

Activity continued on the Gravity Maps of California project. The Needles Gravity Sheet map (scale 1:250,000) and the Death Valley Gravity Sheet map (scale 1:250,000), on the new geologic base map, were released. Work was in progress on most of the remaining 1:250,000 scale map sheets, including Fresno, revised Santa Cruz, Santa Maria, Long Beach, San Diego-El Centro, Salton Sea, Mariposa, Walker Lake, Sacramento, Chico, and Susanville. Data and data sources for the gravity stations on the Santa Rosa, Ukiah, Santa Cruz, and Death Valley sheets were released as Open-file Reports 78-7 SAC, 78-8 SAC, 78-14 SAC, and 79-9 SAC, respectively. The state gravity map at a scale of 1:750,000 was completed and revised in draft form, and the accompanying text was completed and reviewed.

b. Aeromagnetic maps

Aeromagnetic maps for the Sacramento and Santa Rosa 1:250,000 scale sheets were compiled from existing data and released as Open-file Reports 79-13 SAC and 79-14 SAC, respectively. In addition, five unpublished aeromagnetic map sets from different parts of the state that had previously been made available to the Division were released as Open-file Reports 78-13A through 13E SAC. An article summarizing the available aeromagnetic surveys appeared in the May 1979 issue of CALIFORNIA GEOLOGY.

c. Geophysical support

Geophysical field and office support for several cooperative investigations was provided in the form of magnetic surveys, gravity surveys, seismic refraction surveys, and electrical resistivity surveys.

These surveys provided information pertinent to the determination of local bedrock and water depths; the identification of buried faults; the measurements of variations in the thickness of subsurface strata; and the seismic velocity, electrical resistivity, and density of local rock units. Cooperative geophysical investigations were undertaken for the studies tabulated in the "Project status" list both in this section and in the section on Geothermal Resources studies.

5. Earthquake prediction studies.

The Division is using, or has the capability of using, four techniques for studying earthquake precursory effects.

a. Tiltmeter program

The Division's tiltmeter program, to measure tilting of the earth in relation to earthquake activity, was temporarily discontinued in the Parkfield-Cholame Valley region of the San Andreas fault and was terminated at Oroville. Instruments in the Parkfield-Cholame Valley area were first removed for modification, repair, and recalibration; they were then rebuilt and made ready for installation by Kinemetrics Inc. of Pasadena, California. Subsequently, it was decided that, in order for tiltmeters to give more reliable data, site visits and adjustments must be performed more frequently than once a month, as was past practice; preferably, such visits should be performed two or more times each week. Investigations are under way to determine the feasibility of hiring student assistants from Cal Poly San Luis Obispo to do this work.

Two full seasons of tiltmeter operation at Oroville were recorded, as aftershocks of the M 5.7 Oroville earthquake of 1975 continued to decrease in size and frequency. Preliminary analyses of the data have not shown any obvious precursors to any of the aftershocks, but have shown "tilting effects" brought on by seasonal temperature variations that affect the rocks in the vicinity of the fault. When these effects are removed, the record may reveal minor, earthquake-related, tilting events masked by the larger temperature related excursions.

Precursory tilting effects have been observed on Division tiltmeters in the Parkfield area in January 1975 and in April-May 1976. Precursory effects to these same events have also been observed upon careful examination of the Division's telluric current records for the Parkfield area (see section c. below).

b. Gravity

The gravity technique consists of monitoring a series of gravity stations along the San Andreas fault near Cholame. These stations are monitored every three to six months to detect elevation changes that may precede an earthquake. The results to date have shown no detectable elevation changes over approximately the last 5 year period.

c. Telluric currents

The telluric current-self potential method compares telluric current variations in order to indirectly measure rock resistivity changes that may precede earthquakes. The Division is currently operating three telluric current arrays along the San Andreas fault from Parkfield vicinity to California Valley. Results to date have indicated an apparent presursory effect prior to a moderate earthquake in January 1975 in the Parkfield area, and also possible precursory effects to a small swarm of eathquakes that occurred in April-May 1976 and a single small event that occurred in November 1977 in the area north of Parkfield.

Preliminary interpretation of subsequent measurements have so far not shown anomalous readings, and no significant earthquakes have occurred in the array areas. Although the Parkfield area is not populous, it is the site of frequent, small to moderate earthquakes that are concentrated along a relatively narrow, fault zone trace. Earthquake precursor detection techniques, when proven in this favorable environment, can be exported to more populous areas where they can result in many lives saved and greatly reduced property damage.

d. Microacoustic emissions

Microacoustic survey stations (to detect high-frequency emissions in the earth's crust that may occur prior to an earthquake) are maintained at five sites between Palmdale and Parkfield along the San Andreas fault, and are monitored by the Division on a monthly schedule. The sites extend across most of the Valyermo to Cholame valley segment of the fault, which has remained "locked" since the 1857 Fort Tejon earthquake. By selecting an array of stations in and near this critical area, the effects of stress buildup can be tested. The results show a general quieting of background acoustic emissions beginning in early 1976 and continuing, with minor fluctuations, to the present.

The reasons for this trend are not yet thoroughly understood, but consideration has been given to the possibility that aging of the test-site drill holes has had some very local effects. Use, by the Division, of multiple, widely spaced drill holes and probes, and the discarding of emission not recorded simultaneously on two channels, is believed to have minimized any possible effects from this source. Another possible explanation for the quieting trend is suggested by certain laboratory acoustic emission experiments in which a general decrease in emission was observed before the final burst of activity leading to failure. No sudden or "final" increase of activity similar to that observed in the laboratory experiments has been noted in our field studies. Such an increase, if it should occur, would require very careful evaluation and close comparison with the results from other precursory monitoring techniques before any conclusions could be drawn.

The Division has ordered new equipment, including wide-range (1.5 Hz-50,000Hz), microacoustic detection equipment; 4-channel, open-reel recorders; and digital delay lines. This equipment will greatly increase the sensitivity and frequency range of the monitoring system, and permit full-time monitoring and recording of acoustic emission above a

preselected threshold. Full-time monitoring on the San Andreas fault near Parkfield is planned to begin early in fiscal year 1979-80. The new equipment will also be used in the Division's geothermal program as an exploration tool in geothermal resource assessment.

Specific Projects - Status and Staff Assigned

Project (Number reference to section headings)	Status	Staff
Stephens Pass earthquake (1-a and 1-b, 3, and 4-c)	Comprehensive effort in support of investigations of these earthquakes consisted of seismic monitoring, seismic calibration shots, leveling surveys, plane table surveys, and gravity and magnetic surveys. A summary article was published in the February 1979 issue of CALIFORNIA GEOLOGY.	Sherburne, Cramer, Bennett, Chase, Chapman, Chesterman, Campbell, and Durrwachter
Active fault identification (1-b)	Seismic monitoring at Sierra Madre fault zone, Bullards Bar, and Bishop. Fault movement surveys on Pleasanton and Alexander Valley faults.	Cramer, Bennett, Campbell, and Durrwachter
Reservoir induced seismicity (1-a)	Article on possible induced seismicity at Lake Mendocino published in the December 1978 issue of CALIFORNIA GEOLOGY. Continuing investigations of earthquake activity near major reservoirs.	Toppozada and Cramer
Earthquake Catalog pre-1900 (USGS Coop) (2)	Completed first Annual Technical Report to USGS. Released as CDMG OFR 79-6 SAC.	Toppozada, Real, Park, and Bezore
Earthquake Catalog post-1900 (2)	Minor revisions and catalog maintenance. Published Epicenter Map of California 1900-1974. Map Sheet No. 39, 1978.	Toppozada and Real

Foothills fault system (3)	Releveling was completed across the Bear Mountain fault zone near the proposed Parks Bar dam site. A report on the results of a re-leveling survey across the Bear Mountain fault near Auburn was published in the August 1978 issue of CALIFORNIA GEOLOGY.	Bennett
Active fault identification (3)	Remeasurements of selected geodimeter lines were made along the San Andreas fault in two areas. Short range (EDM) lines were measured at sites on the San Andreas, Pleasanton and Healdsburg faults.	Bennett
Crustal movement surveys near Parkfield (3)	Continued monitoring geophysical data.	Bacon, Bennett, and Chase
Crustal strain (3)	Selected geodimeter lines remeasured along San Andreas fault system in the northern San Francisco Bay area and the Parkfield-Cholame Valley fault segment.	Bennett
Gravity map sheets of California, scale 1:250,000 (4-a)	Sheets published: Needles and Death Valley (latter on new geologic base); sheets in preparation: Fresno, Santa Maria, revised Santa Cruz, Salton Sea, San Diego-El Centro, and Long Beach.	Chapman and Chase
Gravity Map of California, scale 1:750,000 (4-a)	Map completed and revised; text completed and reviewed.	Chapman and Chase
Aeromagnetic map of California, scale 1:250,000 (4-b)	Compilations of aeromagnetic data for the Sacramento and Santa Rosa sheets released as Open-file Reports 79-13 SAC and 79-14 SAC, respectively.	Chase, Chapman, and Youngs
Aeromagnetic map of California, scale 1:750,000 (4-b)	Index map showing the locations of aeromagnetic maps in California published in May 1979 issue of CALIFORNIA GEOLOGY.	Chase and Chapman

Eagle Rock - Verdugo fault zone (USGS Coop.) (4-c)	Geophysical field work completed, report in progress.	Chase, Campbell, and Bennett
Raymond Hill-Santa Monica fault zone (USGS Coop.) (4-c)	Report being prepared for all the geophysical work done in this project.	Bennett, Chase, and Chapman
Pasadena-Palmdale (Coop. with California Institute of Technology) (4-c)	Continued monitoring of selected stations for changes in gravity.	Chase and Chapman
Gravity leveling study, Parkfield (4-c)	Continued monitoring of selected stations for changes in gravity; evaluation of data.	Chase, Chapman, Real, and Youngs
Port Wine area study (4-c)	Report in progress.	Chapman and Clark
Telluric current, self- potential	Refer to text in section 5-c.	Bacon and Durrwachter
Microacoustic surveys	Refer to text in section 5-d.	Bacon and Durrwachter

III. Minerals Program

Division activities under the Minerals Program include: (1) The Surface Mining and Reclamation Act (SMARA); (2) Mineral commodities investigations; and (3) Geothermal resources studies.

1. Surface Mining and Reclamation Act (SMARA)

a. Land Classification

The 1975 Surface Mining and Reclamation Act requires local government in areas identified by the Office of Planning and Research to consider mineral resources as a part of land-use planning. Lands are being classified as to their mineral potential on a priority basis by the State Geologist, and some areas will be designated by the State Mining and Geology Board to be of statewide or regional significance.

During fiscal year 1977-78, major classification studies were initiated in the greater Los Angeles area and the southern San Francisco Bay counties. During fiscal year 1978-79, the first completed product of this activity, "Mineral Land Classification of the Greater Los Angeles Area, Parts I and II," was published as Special Report 143. Part I is a description of the mineral land classification project of the greater Los Angeles area; Part II explains the classification of sand and gravel resource areas in the San Fernando Valley production-consumption region.

Work continues on the remaining parts, which cover other production-consumption regions in the greater Los Angeles area. A report on the southern San Francisco Bay counties was nearing completion at year's end.

b. Mine Reclamation

The Division has continued to review mine reclamation plans in accordance with the guidelines of the State Mining and Geology Board published in April 1977. Division staff visits all proposed mining operations in addition to reviewing the reclamation plans submitted. Because the information required in EIRs corresponds in many factors to the content of reclamation plans, many mining reclamation reports are included as part of the EIR process. About 85 reclamation plans were reviewed during the fiscal year.

During November 1978, the State Geologist presented testimony to the federal Committee on Surface Mining and Reclamation (COSMAR), which was formed under the auspices of the Council of Environmental Quality. The Committee was presented with a discussion of California's Surface Mining and Reclamation Act of 1975 and how it compared with the federal Surface Mining Control and Reclamation Act.

One geologist in each of the Division's three Districts is assigned to review reclamation plans. A total of about 1 man-year was spent on the review process. The basic assignment of the staff is to be continually aware of any problems in the application of the state's guidelines on reclamation plans so that the State Mining and Geology Board can act on such information in order to adequately implement SMARA.

2. Mineral commodity investigations

a. Sand and Gravel

A study of the sand and gravel aggregate resources of the San Francisco Bay Area counties, funded largely by a grant from the U.S. Bureau of Mines (USBM), was initiated during fiscal year 1976-77. A final report of this was completed and submitted for publication during the year.

b. Uranium

A mineral commodity investigation was initiated during fiscal year 1977-78 to identify the source and origin of uranium mineralization in the vicinity of the Juniper mine near the crest of the Sierra Nevada in Tuolumne County. This study was modified to include resource favorability data collected during a cooperative study initiated during the year with the Department of Energy.

In May 1978 a second uranium investigation in cooperation with the Department of Energy was initiated as a part of that agency's National Uranium Resource Evaluation (NURE) program. The study, a uranium favorability evaluation of the Trona 1/250,000 quadrangle, continued into Phase II of the planned three-phase study.



Photo 5. The Juniper uranium mine open pit. The working face and 70 meters of overburden that overlie the orebody are shown. Most of the rock in the upper part of the section is andesitic, whereas the sedimentary rocks in the lower part are sandstone beds derived from granitic and rhyolitic rocks. The California Division of Mines and Geology has mineral resources investigation programs to provide the public and the State legislature with up-to-date information on mineral explorations. (Photo by J.S. Rapp.)

c. Tungsten

A statewide evaluation of tungsten resources was planned during the year, but the hiring freeze policy prevented continuation of the project.

Specific Projects-Status and Staff Assigned

Project	Status	Staff
San Francisco region aggregate study	Submitted for publication	Chesterman, Manson, and Stinson
Juniper Mine-Sonora Pass area uranium study	Continuing data collection	Rapp and Majmundar
Trona quadrangle NURE project	Phase I completed Phase II underway	Morton and Bushnell
SMARA land classification, greater Los Angeles area	Parts I and II published as Special Report 143	Anderson, Loyd, Clark, Miller, Corbaley, Kohler and Bushnell
SMARA land classification southern San Francisco Bay area	Project nearing completion	Stinson and Manson

3. Geothermal resources studies

The Division completed its first year of low- and moderate-temperature, geothermal resource assessment under sponsorship of the federal Department of Energy (DOE)/State coupled program. California is one of 15 western states involved in these independent studies to assess this underdeveloped resource. The following tasks were completed:

a. A preliminary geothermal map showing distribution of low- and moderate-temperature ground waters was prepared in conjunction with USGS and DOE staff. This information was incorporated in the USGS Circular 790.

b. Maps showing distribution of Quaternary and older volcanic rocks and hydrothermal mineral deposits also were produced. These were studied, together with seismicity and fault maps of California, to determine the relationship of these features to present-day geothermal activity.

c. Geothermal data--for example, hot spring and well locations, with temperatures and chemical constituents--were gathered from the Division's Map Room file, from unpublished Department of Water Resources (DWR) data, and from other sources. Over 600 such data sets were compiled and submitted to the USGS data bank, GEOTHERM. The process of accumulating and checking validity of data continues.

d. Bottomhole temperature data have been compiled from more than 3,000 oil and gas wells in northern California and from the Huntington Beach oil field in southern California. Thermal data have been contoured manually for Huntington Beach, but contouring the northern California data will be delayed for the availability of automatic processing.

e. Regional geothermal geology studies were completed for the southern Coast Ranges, the Napa-Calistoga Valley area, Mono Basin, and the Imperial Beach part of San Diego County.

f. Gravity, magnetic, and shallow resistivity surveys were performed at Bridgeport preliminary to planned drilling at a Department of Transportation (Caltrans) maintenance facility.

g. Detailed geologic and hydrologic studies were started at Paso Robles, where a large confined body of 110° F water lies below the surface. The development of site-selection criteria for choosing Phase II reservoir-assessment studies began.

h. A new contract with DOE was negotiated for \$230,000, of which \$200,000 will be federal money.

Assigned Staff

Program Manager and P.I.
Technical and management assistance
Geophysical support

Geochemical support
Phase I, lead geologist
staff geologist assigned
at different times

Phase II, Lead geologist
Geophysicist

Martin
Bacon
Chapman and
Chase
Majmundar
Higgins
Levine
Huntley
Bortugno, and
Vannice
Olmstead
Youngs

Noncontract Geothermal Function

Geothermal Resources Board T.A.C.	Member	Bacon
	Observer	Martin

IV. Basic Geology Program

The Division's basic geology activities are fundamental to the development of mineral resources information, to the application of engineering geology concepts to land-use decisions, and to general land-use analyses. The basic objective is to understand and describe the distribution and physical properties of rock units so that the State may advise in matters concerning the geology of any part of the State. Among other results, such investigations have assembled most of the available information concerning the location of faults in California and their relative activity.

Within this general program, the Division has undertaken (1) areal geologic mapping, (2) geologic compilation, (3) geochemical support, (4) subsurface data collection, and (5) preparation of indices to basic geologic information.

1. Areal geologic mapping

Currently, the geologic mapping in progress is for environmental geology investigations rather than basic geologic mapping per se. The mapping listed under the geologic hazards program, although different in scale and areal extent from conventional basic geologic mapping, provides much useful data.

2. Geologic compilation

a. Regional geologic map

The start of a new, 1:250,000 scale, Regional Geologic Map series was a major effort. These maps depict formational units - rock stratigraphic units rather than the time-lithologic units used in the previous 1:250,000 series.

The initial map, the Sacramento 1° x 2° quadrangle, was completed in draft form for review and format decisions. In addition to the geologic map and cross-section, the compilation will include a map of the locations of samples that have been dated by radiometric methods, an index to source data, and geologic map explanation.

Plans were underway to start work on the adjacent Santa Rosa sheet.

b. COSUNA

This acronym means the Correlation of Stratigraphic Sections of North America, a project started by Professor Orlo E. Childs of Texas Tech University and sponsored by the American Association of Petroleum Geologists

(AAPG). The main objective is to publish a set or sets of columnar stratigraphic sections, representative of the geology within the many geologic provinces of the United States. The California Division of Mines and Geology is involved in coordinating the California part of this project over the next year or two. James F. Davis, State Geologist, Sacramento, and Charles C. Bishop, Geologist, San Francisco District, have been named California Region Coordinators.

The general format will follow that of the charts published by the Geological Survey of Canada as a part of Economic Geology Report No. 1, 1970. For purpose of compilation, the United States has been divided into a number of geologic provinces as shown on the Geologic Code Map of AAPG's Committee on Statistics of Drilling. The stratigraphic sections will be grouped by province, and these will be combined into regions. The California Region includes most of California and that part of Oregon that lies within the Klamath Mountains province, but excludes Modoc and Lassen Counties as well as Mono and Inyo Counties, which lie within the Great Basin Region.

The AAPG-CSD Code map divides the California Region into 14 onshore and 3 offshore provinces (Figure 4). The boundaries of the onshore areas follow county lines rather than natural geomorphic province boundaries in order to accomodate the computer program to which the Code map is linked.

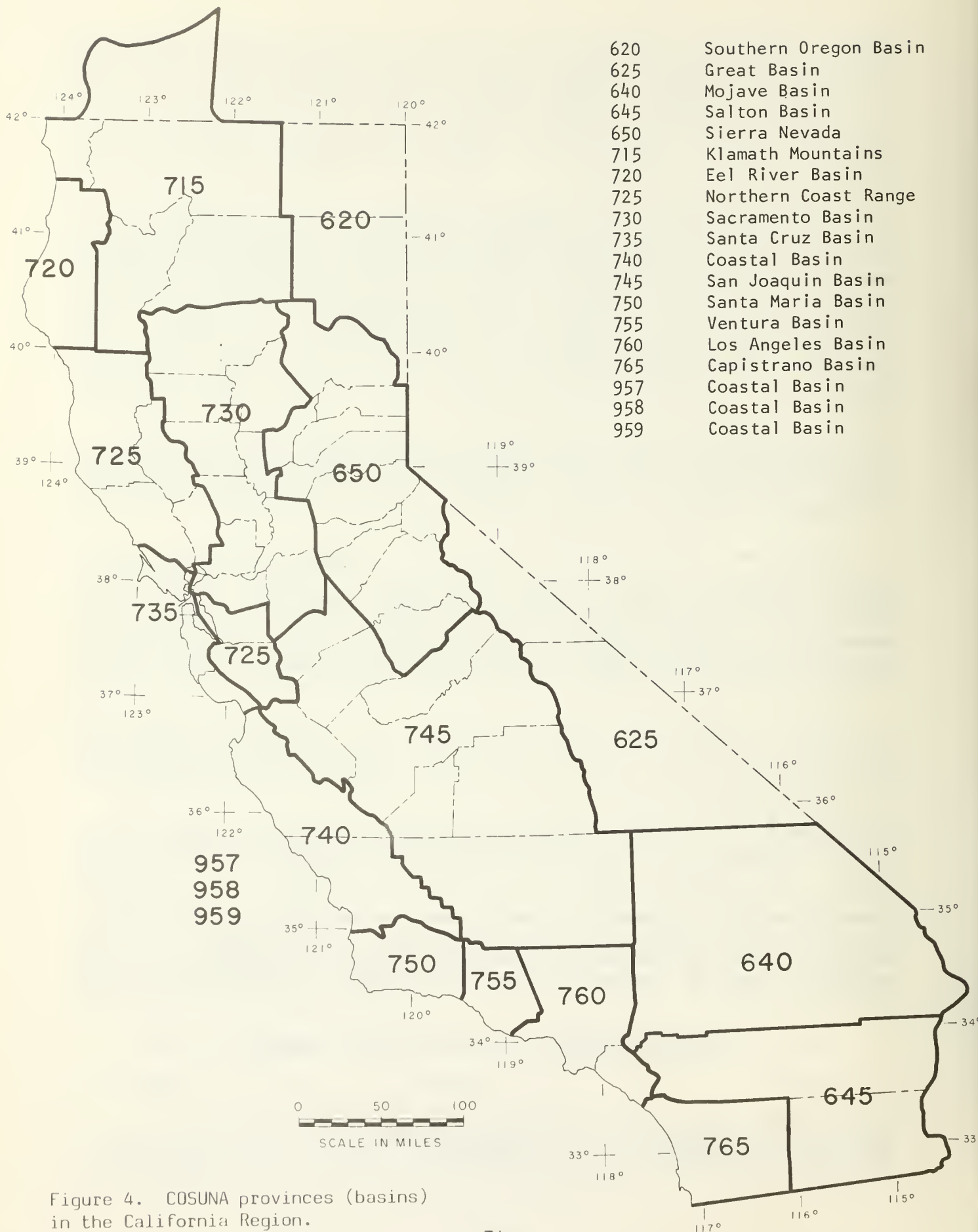
Although work on the COSUNA Project has been going on for some time in other regions of the country, the effort in California has only recently started. Under the planned schedule, the basic data will be compiled and all of the individual sections within this region will be constructed and assembled in chart form within the calendar year of 1979. The problems of correlation that undoubtedly will arise must then be resolved prior to final drafting and publication, which will be done by Childs and his committees.

Province chairmen have been selected for the 14 California provinces, and efforts are being made to gain the support and cooperation of members of the geologic profession within the California Region to act as compilers of individual columns.

Although the emphasis will be on subsurface sections, the complexity of California geology is such that both surface and subsurface sections will be needed. The petroleum industry will be asked to provide most of the help with the subsurface and soft rock work, and the academic and governmental communities will be asked to provide the surface and hard rock input. Division staff members have been encouraged to participate. It is anticipated that a minimum of five sections will be required for each province in order to adequately portray the geology and stratigraphy of the California Region.

Specific Projects - Status and Staff Assigned

Project	Status	Staff
Sacramento 1° x 2° quadrangle, Regional Geologic Map	Draft copy completed for review.	Jennings, Bortugno, Ristau, and Wagner



COSUNA

Province chairman
selected. Compilation
in progress.

Bishop

3. Geochemical support

The geochemical section provides support to other Division project activities and to independent projects of the geochemical staff.

a. 1977-78 supplementary report

The following represents detail that was not available for entry in last year's Annual Report. During the year 1977-78, about 300 samples were processed and analyzed. The primary work was in support of the following studies and projects: Auburn dam review project, deep-sea core studies, geothermal investigations, Humboldt County soil erosion studies, Juniper uranium mine, LNG site investigations, Monterey County geochemical study, Orange County co-op, Raymond Hill fault studies, and studies in soils-slope stability relationships. Development of several analytical procedures continued.

During the 1977-78 fiscal year, the working title of one of the Associate Geochemist was changed to Soil Mineralogist, and he was separated from the geochemical section.

Specific Projects - Status and Staff Assigned

Project	Status	Staff
Auburn dam review project		
Physical testing of soil and sediment samples - determination of engineering properties	Investigation in progress. Results to Borchardt.	Majmundar and Loza
Clay mineralogy determination of soil and sediment samples by x-ray diffraction	Investigation in progress Results to Borchardt.	Majmundar and Loza
Ca:Fe ratio determination in clay and soil samples	Calcium and iron being determined by x-ray fluorescence. Investigation in progress.	Majmundar, Borchardt, and C. Smith
Physical testing of deep-sea core samples	Results submitted to Kilbourne.	Majmundar and Loza
Analysis of water samples and evaporates from the geothermal areas	Results submitted to Bacon.	Majmundar and C. Smith

Physical testing of samples from the soil-erosion studies in Humboldt County	Results have been submitted to Hauge.	Majmundar and Loza
Juniper uranium mine investigations		
Geological and geochemical study of the volcanics of Juniper Mine area, Tuolumne County	Investigation in progress.	Majmundar
Radiometric equivalent analysis of core samples obtained from Luck Mc Uranium Company, Reno, Nevada	Investigation in progress.	Majmundar, Borchardt, C. Smith, and Rapp
Determination of potassium and iron by atomic absorption spectrophotometer and determination of various minor and trace elements by optical emission spectograph, in the samples collected from Juniper Mine area	Investigation in progress.	Majmundar and C. Smith
Clay mineralogy and engineering properties of soil samples in the LNG site investigations	Results submitted to Borchardt	Majmundar and Loza
Distribution of heavy elements potentially hazardous to health, Salinas Valley region, Monterey County		
Trace elements in stream sediments, Monterey County	A summary of Open-file 77-5 SF was published in the October 1977 issue of CALIFORNIA GEOLOGY.	Majmundar
Arsenic, cadmium, copper, lead, mercury, and zinc in stream sediments, Monterey County	Report prepared for publication. In review process.	Majmundar
Orange County Co-op; clay mineralogy and engineering properties of soil samples	Results have been submitted to LA District (Miller and others).	Majmundar and Loza
Raymond Hill fault studies; clay mineralogy and engineering properties of soil samples	Results submitted to Borchardt.	Majmundar and Loza

Soils and slope stability

Clay mineralogy and slope stability	Report prepared and submitted for publication.	Borchardt, Lofgren, and Loza
Physical testing of soils for urban development	Report published in the November 1977 issue of CALIFORNIA GEOLOGY.	Borchardt
Physical testing of soil and sediment samples; clay mineralogy	Physical tests on sedimentary materials: particle size distribution, Atterburg limits, bulk density, and mineralogy determination by x-ray diffraction.	Borchardt, Majmundar, Lofgren, and Loza

Procedures development

Development of procedure for fluorometric determination of uranium at low levels	In progress.	Majmundar and de Rama
Procedure development for Ag, Al, As, Au, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Na, Ni, Pb, Zn	Atomic absorption spectrophotometric procedures for these elements (at trace concentrations) are being developed and improved.	Majmundar and C. Smith
X-ray diffraction analysis of clay minerals	Development of rapid procedures in progress.	Majmundar and Loza

b. 1978-79 report

During the year 1978-79, about 575 samples were processed, most of which were supplied by the two geologists working on a National Uranium Resources Evaluation (NURE) project on the Trona quadrangle. This has been a very critical year for the geochemical section, as two of the Laboratory Technicians transferred as Junior Chemists to the Department of Public Health. The resulting staff shortage was only partly resolved through a contract for student help from San Francisco State University. One Laboratory Technician position was downgraded to Laboratory Assistant and filled by transfer.

Other than the Trona - NURE project, Geochemical Section support was provided to the Juniper uranium mine study, the Monterey County geochemical study, and procedures development.

Specific Projects - Status and Staff Assigned

Project	Status	Staff
Trona - NURE	As received, samples are crushed, pulverized, blended, split and sent to (a) Uranium West Labs; (b) Spectre Co. Labs; (c) Bendix Corporation.	Majmundar, C. Smith, and student assistants
Juniper uranium mine		
Geological and geochemical study of the volcanic rocks in the mine area	Investigation in progress.	Majmundar
Determination of beryllium and lead by atomic absorption spectrophotometer	Investigation in progress.	Majmundar and C. Smith
Determination of phosphorus by rapid silicate analytical method	Investigation in progress.	Majmundar and C. Smith
Monterey County study		
Distribution of heavy elements hazardous to health, Salinas Valley Region	Report completed and in review.	Majmundar
Procedures development		
Procedure development of various cations and anions for geothermal fluid samples	In progress.	Majmundar and C. Smith
Revision and modification of procedure for fluorometric determination of uranium at low levels	In progress.	Majmundar and C. Smith

4. Sub-surface data collection

a. California Well Sample Repository

The Division of Mines and Geology has participated in the establishment, sustaining support, and advisory guidance of the California Well Sample

Repository, which is located on the campus of California State College, Bakersfield. The Repository is the first public facility of its kind in California and fulfills a long recognized need to assemble, process, preserve, catalog, and make available for public use, a collection of rock samples representative of the geologic history, stratigraphic sequences, rock properties, and mineral resources of the State of California.

The Repository presently contains cores and ditch samples from more than 3,000 oil and gas wells located throughout the state and its offshore areas. Additionally, other materials available for use and inspection include foundation boring samples from various major engineering projects and examination slides processed for microfauna from over 850 California wells and 214 outcrop localities. An annual catalog of the contents of the Repository is distributed on request.

The Repository is operated by the California State College, Bakersfield, Foundation, with the guidance and support of an Advisory Committee composed of representative from the petroleum industry, professional scientific societies, institutions of higher education, and state and federal government. The Division is represented on this Advisory Committee. During fiscal year 1978-79, the Division provided \$6,000 for the operation and maintenance of the Repository for the general public benefit. Energy and mineral resource development based on investigative studies of rock materials assembled at this Repository will result in manifold benefits to the people of California.

b. Sub-surface data collection

A wide variety of Division projects involve the collection of sub-surface data. The most important of these projects during fiscal year 1978-79 have been seismic ground response investigations, mineral land classification studies (SMARA), and site review and fault evaluation projects.

Specific Projects - Status and Staff Assigned

Project	Status	Staff
California Well Sample Repository	Ongoing. Nominal support by Division.	Sprotte
Sub-surface data	Ongoing in several projects. Trench logs kept in SF District Office under the cognizance of . . .	Kilbourne
	Southern California material under cognizance of . . .	Sprotte

5. Indices to basic geologic information

Specific Projects - Status and Staff Assigned

Project	Status	Staff
Index to geologic maps, 1969-75	Published as Special Report 130.	Kiessling
Index to geologic maps, 1976-77	Indexing for 1975 com- pleted; 1977 in progress.	Kiessling and McMillan
Index to graduate Theses and Dissertations on California geology:		
For 1975-76	Published in the April 1978 issue of CALIFORNIA GEOLOGY.	Peterson and Saucedo
for 1977-78	In progress.	Saucedo
Faults and geologic data of California - an index and explanation of the source data used to compile the geologic and fault maps of California, scale 1:750,000	Report in progress. To be published as Bulletin 201.	Jennings

V. Geologic Information Program

1. Publications

Information about the geology, mineral resources, and geologic hazards of California is published by the California Division of Mines and Geology (CDMG) and distributed to professionals and interested lay-persons. The results of studies made by scientific staff members of the Division and others in the earth science professions are published in CALIFORNIA GEOLOGY, the Division's monthly magazine, and in bulletins, special reports, map sheets, special publications, preliminary reports, and geologic maps.

The publications staff reviewed the technical content of manuscripts, edited manuscripts and maps, drafted illustrations and maps, coordinated printing and lithography, negotiated printing contracts, managed the printing budget, and supervised the distribution of the final printed reports. Revenue from the sale of Division publications during fiscal year 1978-79 was \$141,735.

News releases concerning the Division's publications are prepared and distributed to the media. Thousands of inquiries received annually by the Division are answered by supplying copies of CDMG Notes, CALIFORNIA GEOLOGY and, when warranted, by individual letter from a member of the technical staff. These activities help to inform the public of the importance of geology to the economy of California.

An information and public sales desk is maintained at each District office.

a. New publications released

- .Bulletin 197. Limestone, dolomite, and shell resources of the Coast Ranges Province, California. 103 p., 21 tables, 9 figures; Plate 1 (1:1,000,000), Plate 2 (1 inch equals 3/4 mile). \$6.00.

This report describes the developed deposits of limestone, dolomite, and shells in the Coast Ranges and the reserves of raw carbonate materials.

- .Special Report 130. Index to geologic maps of California, 1969-1975. By E.W. Kiessling and D.H. Peterson. 121 p. \$5.00.

This index lists about 600 references to surface geologic maps which have been open-filed or published since 1969.

- .Special Report 133. Clay mineralogy and slope stability. By G.A. Borchardt. 15 p., 6 tables, 4 figures. \$1.00.

The report summarizes the clay mineralogy of 127 landslide, soil, and sedimentary rock samples from the Coast Ranges of California.

- .Special Report 135. Seismicity of California 1900-1931. By T.R. Topozada, D.L. Parke, and C.T. Higgins. 41 p., 10 figures, 2 tables. \$2.50.

This report describes earthquake activity in California for the 32 years preceding the establishment of statewide seismographic stations in 1932. The majority of epicentral locations and magnitudes were estimated from the distribution and severity of the reported felt effects. The report contains epicenter maps depicting the seismicity of California for successive 5-year intervals and for the entire 32-year interval; 517 earthquakes are described.

- .Special Report 137. San Gregorio-Hosgri fault zone. Edited by E.A. Silver and W.R. Normaek. 56 p. \$2.50.

The collection of papers provides an overview of the San Gregorio-Hosgri fault zone, including details of fault location, continuity between the San Gregorio and Hosgri fault segments, offset history of each segment, evidence of Holocene movements, and seismicity.

- .Special Publication 52. Earthquake catalog of California, January 1, 1900 - December 31, 1974. By C.R. Real, T.R. Topozada, and D.L. Parke. 15 p. Microfiche included. \$3.00.

This report is an explanation of the information and methodology used in compiling the magnetic tape listing of earthquakes.

.Preliminary Report 22. Compilation of strong-motion records from the Santa Barbara earthquake of 13 August 1978. By L.D. Porter. 43 p., 4 tables, 3 figures. \$1.00.

This report presents the preliminary analysis of strong-motion records from the Santa Barbara earthquake of 13 August 1978.

.Preliminary Report 23. Processed data from the partial strong-motion records of the Santa Barbara earthquake of 13 August 1978, preliminary results. By L.D. Porter, J.T. Ragsdale, and R.D. McJunkin. 93 p. \$1.00.

The report presents significant data from the record analysis of approximately the first 10 seconds of earthquake motion recorded at three California Division of Mines and Geology accelerograph stations in the Santa Barbara area.

.Map Sheet 31. Geology of the Willow Creek 15' quadrangle, Humboldt and Trinity Counties, California. By J.C. Young. Scale 1:62,500. 3 cross sections. \$4.50.

The geology of Willow Creek quadrangle is shown in color and structural features are delineated on a topographic base map. A 16-page geologic report describes the major rock units, structural geology, landslides and slope stability, and mineral resources potential of the area.

.Map Sheet 33. Geology of the southwestern part of the Oat Mountain quadrangle, Los Angeles County, California. By J.R. Evans and R.V. Miller. Scale 1:12,000. \$4.50.

The geology of the quadrangle is mapped at a scale of 1:12,000. The geologic structure is shown in two cross sections and by symbols on the map. A description of the geologic units is printed on the map sheet.

.Map Sheet 39. Earthquake epicenter map of California, 1900 through 1974. Compiled by C.R. Real, T.R. Topozada, and D.L. Parke. Scale 1:1,000,000. \$2.00.

The map shows 2,427 separate epicenter locations representing 3,602 earthquakes. A list of 452 events equal to or greater than magnitude 5.0 is included on the map.

.Needles sheet of the Bouguer Gravity Map of California.
By R.H. Chapman and J.D. Reitman. Scale 1:250,000. \$4.00.

Bouguer anomaly values were contoured with a 5-milligal contour interval and overprinted on the Needles sheet of the Geologic Atlas of California. The gravity survey is described in a 6-page booklet.

b. Publications reprinted

- .Special Report 52A. Index to geologic maps of California, 1957-1960. By J.B. Koenig. \$3.00.
- .Special Report 74. Index to graduate theses on California geology to December 31, 1961. By C.W. Jennings and R.G. Strand. \$2.00.
- .Special Publication 50. Colemanite deposits near Kramer Junction, San Bernardino County, California. \$1.00.
- .Special Publication 51. State policy for surface mining and reclamation practice. Prepared by the California State Mining and Geology Board. No charge.
- .County Report 1. Mines and mineral resources of Kern County. By B.W. Troxel and P.K. Morton. \$8.50.
- .Map Sheet 8. Geology of the Palo Alto quadrangle, Santa Clara and San Mateo Counties, California. By T.W. Dibblee, Jr. \$2.00.
- .Map Sheet 39. Earthquake epicenter map of California, 1900 through 1974. By C.R. Real, T.R. Topozada, and D.L. Parke. \$2.00
- .Death Valley sheet of Bouguer Gravity Map of California. Scale 1:250,000. Reprint of the 1973 gravity contours on new geologic base (1977, Death Valley sheet). Colored, \$4.00.

The following reprint sheets of the Geologic Atlas of California, scale 1:250,000, were released:

Alturas sheet	Redding sheet
Kingman sheet	San Luis Obispo sheet
Long Beach sheet	Santa Ana sheet
Mariposa sheet	Trona sheet

Colored, \$2.50; uncolored, \$1.50.

c. CALIFORNIA GEOLOGY

Major articles published in the monthly magazine were:

Geology and slope stability in The Geysers geothermal resources area.
Well site safety at The Geysers.
Foothills fault system and the Auburn dam.
Crustal movement on the Foothills fault system near Auburn, California.
Juniper uranium mine, Tuolumne County, California.
Gold rush of the 1970s.

California mining review, 1976-1977.
 A lichen indicator of copper mineralization, Plumas County, California.
 Plate tectonics - its influence on man.
 Geological investigation of disposal sites for hazardous waste.
 Ground water use in California.
 Ukiah earthquake, 25 March 1978.
 Coal deposits of California, an annotated bibliography.
 Slope instability and debris flows, Los Angeles area.
 Bluebird Canyon landslide of October 2, 1978, Laguna Beach, California.
 Mudflow/debris flow damage, Los Angeles area, February 1978.
 Energy from sunlight.
 Stephens Pass earthquakes, Mount Shasta, August 1978.
 Chorro delta, a birdfoot delta.
 Coastline erosion, Santa Cruz County.
 Strong motion instrumentation program.
 Aeromagnetic surveys in California.
 Fault creep measurement.
 The geologist's role in timber harvesting plan review.
 Soil erosion in California's coast forest district.

d. Revised CDMG Notes

.CDMG Note 5. Serpentine, California State rock.
 .CDMG Note 6. Mineral exhibit and library.
 .CDMG Note 9. CALIFORNIA GEOLOGY subscription form.
 .CDMG Note 23. How earthquakes are measured.

e. Open-file reports

Reports of Division investigations are released on open-file to make the data available as soon as possible after the studies are completed. This enables interested professional geologists and other users to obtain the data prior to formal publication. The following reports were released on open-file during fiscal year 1977-78:

OFR 78-17 LA. Geologic map of the Pt. Buchon area, San Luis Obispo County, California, with summary comments. By G.B. Cleveland. The report consists of a geologic map (1 inch = 1000 feet) covering several square miles along the coast and a brief text. Special attention is given on the map to structural and geomorphic features exposed along the shoreline.

OFR 79-1 LA. Geology and fault activity of the Valyermo segment of the San Andreas fault zone, Los Angeles County, California. By Allan G. Barrows. 3 plates, map scale 1:12,000.

OFR 79-2 LA. Geology and fault activity of the Lake Hughes segment of the San Andreas fault zone, Los Angeles County, California. By David J. Beeby. Map scale 1:12,000.

OFR 79-4 LA. Landslides in the Los Angeles region, California - effects of February and March 1978 rains. By F.H. Weber, Jr., J.A. Treiman, S.S. Tan, and R.V. Miller. This report provides a perspective view of landsliding and damages, assesses the situation, and provides a basis for remedial and preventative action.

OFR 78-9 SF. Chemical stabilization of landslides: Diablo Clay. By G. Borchardt. This study includes a literature review and a laboratory evaluation of chemicals for increasing the shear strength of landslides containing expansive clays. The effects of chemical treatments were monitored by determining the liquid and plastic limits on Diablo clay, the test soil.

OFR 78-10 SF. Summary report - fault evaluation program, 1977 area (Los Angeles Basin Region). By E.W. Hart, D.P. Smith, and T.C. Smith. Map scale 1:250,000. This report summarizes the results of work conducted in the second year of a 10-year program. More than 35 potentially active faults were evaluated in 1977 as regards the hazard of surface fault rupture. Data on recency of faulting is presented. Those faults which meet the criteria of "sufficiently active and well-defined" were recommended for zoning under the Alquist-Priolo Special Studies Zones Act of 1972.

OFR 78-11 SF. Environmental geologic analysis of the Diablo Range study area I, southern Santa Clara County, California. By C.F. Armstrong and D.L. Wagner. Map scale 1:12,000. This cooperative study with Santa Clara County covers approximately 14 square miles in the west central portion of the Diablo Range, east of the town of Gilroy (companion study to OFR 78-12 SF). Information is given on geologic factors pertinent to land-use planning (slope stability, fault rupture, seismic response). Mineral resources, waste disposal potential, ground water potential, and seismic history of the area are discussed.

OFR 78-12 SF. Environmental geologic analysis of the Diablo Range study area II, southern Santa Clara County, California. By D.L. Wagner. Map scale 1:12,000. This cooperative study with Santa Clara County covers approximately 14 square miles in the west central portion of the Diablo Range, east of the town of Morgan Hill (companion study to OFR 78-11 SF). Information is given on the geologic factors related to engineering developments and land-use planning.

OFR 78-8 SAC. Principal facts and sources for 888 gravity stations on the Ukiah 1° x 2° quadrangle, California. By R.H. Chapman and C.C. Bishop. Scale 1:250,000. Basic data for 888 gravity stations are given, and station locations are plotted. Complete Bouguer anomalies have been computed for all stations.

OFR 78-13A SAC. Aeromagnetic Map of the Modoc Area (scale 1:250,000).

- OFR 78-13B SAC. Aeromagnetic map of the Mt. Shasta area (scale 1:250,000).
- OFR 78-13C SAC. Aeromagnetic map of the Eureka-Cape Mendocino area (scale 1:250,000, only a few contours shown).
- OFR 78-13D SAC. Aeromagnetic maps of the north half of the Sacramento Valley (scale 1:250,000, 2 large sheets).
- OFR 78-13E SAC. Aeromagnetic maps of the north coastal area (scale 1:62,500, eleven sheets). Aeromagnetic surveys 13A, 13B, 13C, and 13D have anonymous sources; survey 13E was flown for the California Department of Water Resources.
- OFR 78-14 SAC. Principal facts and sources for 1,743 gravity stations on the Santa Cruz $1^{\circ} \times 2^{\circ}12'$ quadrangle, California. By R.H. Chapman and C.C. Bishop. Scale 1:250,000. Basic data for 1,743 gravity stations are given, and station locations are plotted. Complete Bouguer anomalies have been computed for all stations.
- OFR 79-5 SAC. Map showing locations of gravity stations used in the compilation of the Gravity Map of California and its continental margin. Compiled by H.W. Oliver, R.H. Chapman, and Shawn Brehler. 2 sheets, scale 1:750,000. Basic data for the stations are given, and station locations are plotted. Complete Bouguer anomalies have been computed for all stations.
- OFR 79-6 SAC. Annual technical report - 10 February 1978 to 9 February 1979. Compilation of pre-1900 California earthquake history. By T.R. Topozada, C.R. Real, S.P. Bezore, and D.L. Parke. This report summarizes the results of studies of the 125 largest pre-1900 California earthquakes.
- OFR 79-7 SAC. Principal facts and sources for 1,607 gravity stations on the Santa Rosa $1^{\circ} \times 2^{\circ}$ quadrangle, California. By R.H. Chapman. Scale 1:250,000. Basic data for 1,607 gravity stations are given, and station locations are plotted. Complete Bouguer anomalies have been computed for all stations.
- OFR 79-9 SAC. Principal facts and sources for 857 gravity stations on the Death Valley $1^{\circ} \times 2^{\circ}$ quadrangle, California and Nevada. By R.H. Chapman. Scale 1:250,000. Basic data for 857 stations are given, and station locations are plotted. Complete Bouguer anomalies have been computed for all stations.

2. Library

The Division's library, located in the San Francisco District Office, is primarily a research and source facility for the Division's professional staff, but it is also open to the public for reference reading and research use. The books, periodicals, maps, and government documents in the

collection represent an up-to-date, comprehensive selection of materials of use to Division scientists and investigators.

During the year the library acquired and put into use a new card catalog file and an IBM microprint reader-printer. (The old reader-printer was sent to the Los Angeles District Office.) A new map case and revolving periodical racks were ordered.

Two important improvements of the collection were initiated. The Division's photograph file was transferred from the Headquarters Office to the library, where, once the photographs are cataloged, they will be more accessible for use by staff members. A special reference section on geothermal energy was established, and plans to build a more comprehensive collection of books on the subject were made.

The position of Library Technical Assistant was transferred to Headquarters and used for another position.

3. Mineral Exhibit

The Division's Mineral Exhibit, located on the second floor of the Ferry Building in San Francisco, is open to the general public on weekdays, Monday through Friday, from 8:00 a.m. to 5:00 p.m. Tourists continue to view the museum but school tours have decreased, probably due to transportation cutbacks. Both the opening of the Larkspur Ferry Terminal and the opening of new tourist areas on the Embarcadero has brought an up-turn in the number of visitors to the museum, particularly visitors from foreign countries.

A new case of Japanese minerals was made possible by the generous donation of a Japanese mineral collector. Several new minerals named in honor of friends of the Mineral Museum were also donated to add to the collection.

Summer student help again cleaned the museum floors and the curatorial rooms. One student completed an accurate inventory of all the specimens on display, case by case, a task which has needed doing for sometime.

Guest exhibit displays were designated and taken to several annual gem and mineral shows: gold facsimiles were displayed at the East Bay Gem and Mineral Society show; silver and silver ores were displayed at the Vallejo Gem and Mineral Society's 25th Annual Show featuring silver, as well as at the Vaca Valley and Fairfield show; opals were displayed at the Gem and Mineral Society of San Mateo show and the San Francisco Gem and Mineral Society show; and jade was displayed at the California Federation of Mineralogical Societies' annual state show at Sacramento.

The San Francisco District Office set-up and manned a display booth at the Geological Society of America's convention at San Jose State University.

The current interest in gold continued unabated, and many questions were asked over-the-counter and by telephone concerning how and where to find gold. Earthquake questions also continued, and the Division's fault and geologic maps scale 1:750,000 were helpful in answering some of them.

ADMINISTRATION AND ORGANIZATION

James F. Davis assumed the position of State Geologist on March 21, 1978. Under his leadership, the Division was reorganized to facilitate three primary operational functions: (1) information collection, (2) information application (advisory services), and (3) information distribution.

As part of the Division re-organization, an Advisory Services unit was created. Its responsibility is to carry out, under the direction of the Advisory Services Officer, all Division review activities, the most important of which involve Environmental Impact Reports, critical structures evaluations, hospital site reports, contract work with the California Coastal Commission, contract work with the Energy Commission, LNG site evaluations for the Public Utilities Commission, and timber harvest plans.

The Division's organization during fiscal year 1978-79, shown in Figure 5, reflects these organizational changes. Perry Y. Amimoto, Supervising Geologist, served in the new position of Advisory Services Officer; Rudolph G. Strand, Supervising Geologist, served in the position of Special Programs Officer. Supervising Geologists serving as District Geologists in charge of the three district offices were: Cliffton H. Gray, Jr., Los Angeles District Office; John T. Alfors, Sacramento District Office; and Richard M. Stewart, San Francisco District Office. The responsibilities and classifications of other staff members are shown in the list of "Permanent Staff Members, June 30, 1979" presented in section II below.

The new State Geologist also placed the Division on a quarterly management basis, starting with the first quarter of the fiscal year. Preceding each quarter, or within the early part of each quarter, a Quarterly Management Meeting is held to establish program and project goals for the quarter and to review program performance for the quarter just ended. As part of the quarterly management process, allocations of staff time to programs and projects are made, and definitions of measureable program and project objectives--identifiable progress milestones--are established. Division Headquarters administrative staff, program managers, and District Geologists constitute the management team involved in the quarterly meetings.

I. Districts

The Division's programs are carried out through three district offices located in Los Angeles, Sacramento, and San Francisco and the Office of Strong Motion Studies, located in Sacramento. The area of responsibility of each of these Districts is shown in Figure 6.

1. Los Angeles

The Los Angeles District Office serves all of southern California and comprises 11 counties bounded on the north by, and including, the counties

CALIFORNIA DIVISION OF MINES AND GEOLOGY
January 1, 1979

GOVERNOR OF CALIFORNIA
SECRETARY, THE RESOURCES AGENCY
DEPARTMENT OF CONSERVATION

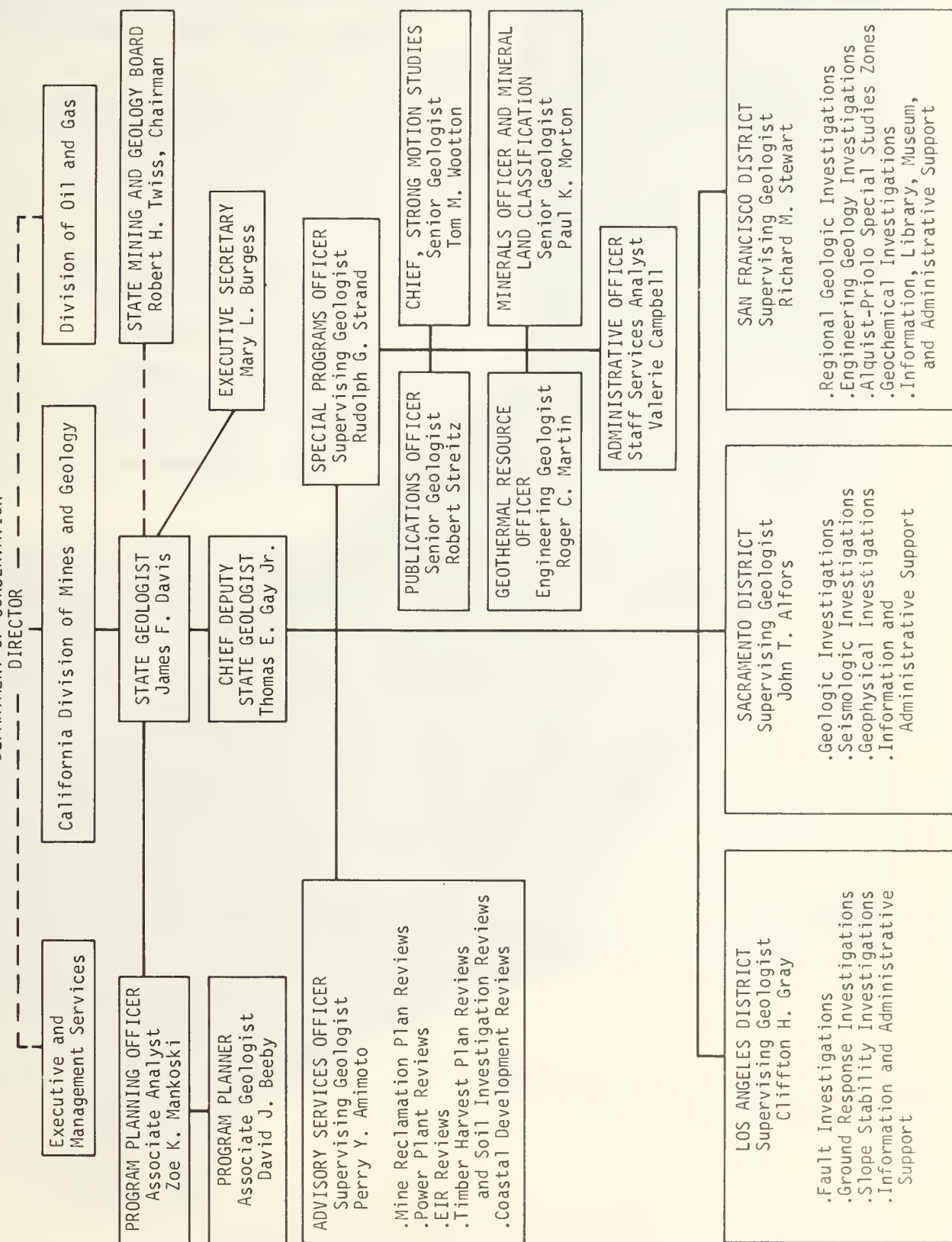


Figure 5. Organization of the California Division of Mines and Geology (1979).

CALIFORNIA DIVISION OF MINES AND GEOLOGY DISTRICTS

—DISTRICT OFFICES—

● SACRAMENTO

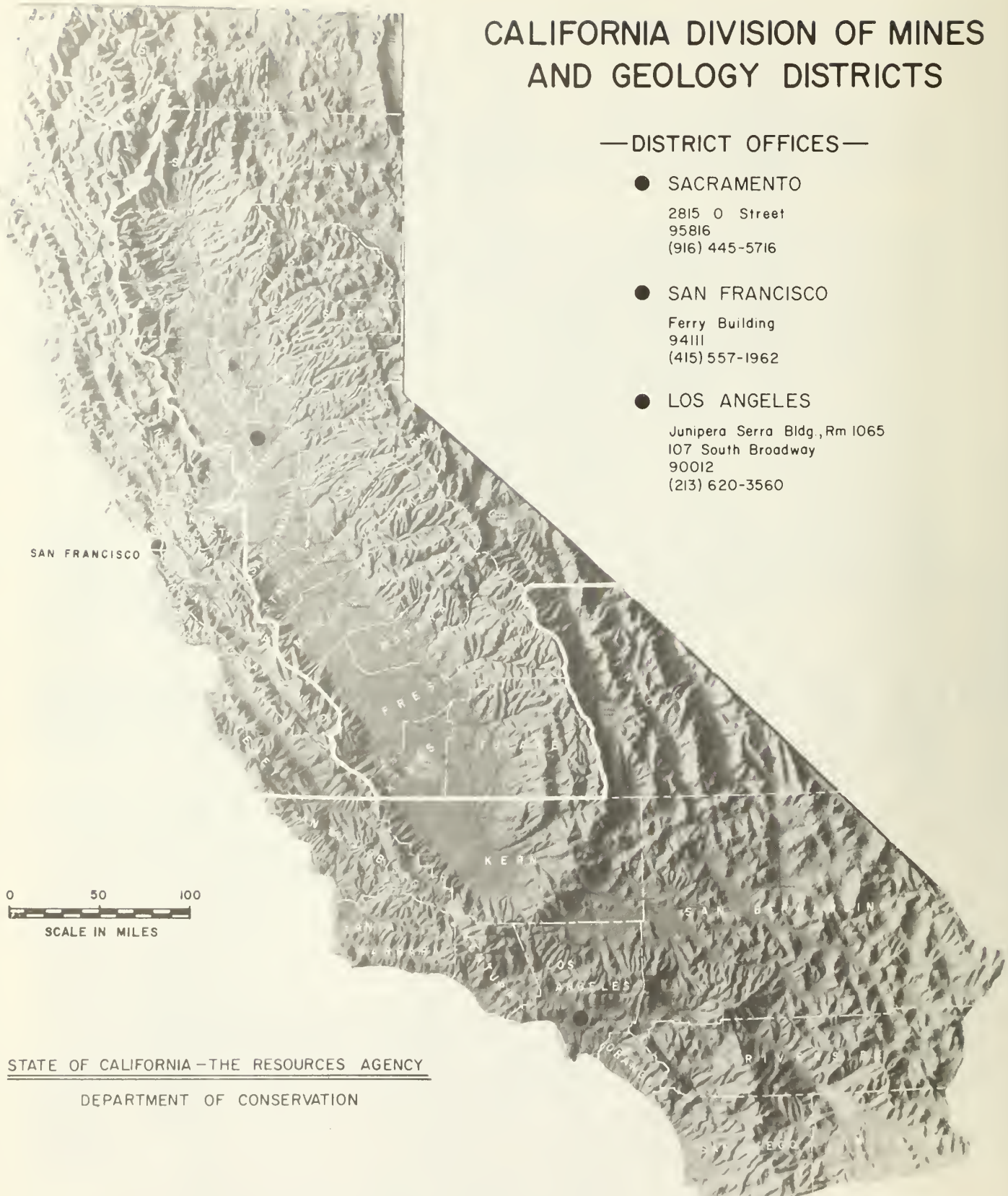
2815 O Street
95816
(916) 445-5716

● SAN FRANCISCO

Ferry Building
94111
(415) 557-1962

● LOS ANGELES

Junipera Serra Bldg., Rm 1065
107 South Broadway
90012
(213) 620-3560



STATE OF CALIFORNIA - THE RESOURCES AGENCY
DEPARTMENT OF CONSERVATION

Figure 6. California Division of Mines and Geology, Districts.

of San Luis Obispo, Kern, and Inyo. The District Office is located in the Junipero Serra Building at 107 South Broadway in the Los Angeles Civic Center.

The District staff includes 20 geologists, 1 geologic aid, 2 drafting technicians, 5 secretaries, and 2 temporary student assistants. Small field offices are maintained near projects: currently field offices are located in San Diego, Santa Ana, and on the UCLA campus. The San Luis Obispo office was closed in April 1979. The Los Angeles District maintains a public information center as well as a small technical library.

The bulk of the project work of the District is concerned with geologic hazards and environmental geology as it relates to proper land use. Much of this work involves cooperative investigations with other governmental agencies, chiefly with the U.S. Geological Survey but also with local counties. During the current year, these investigations have continued to concentrate heavily upon active and potentially active faults. A special hazards study of landslides in the Los Angeles region resulting from the locally torrential February-March 1978 rains was completed. Mineral resources studies received additional emphasis, and the classification, under SMARA, of lands for mineral potential in portions of the greater Los Angeles area was accelerated.



Photo 6. Bluebird Canyon landslide, Laguna Beach, California. This landslide occurred on October 2, 1978, destroying or damaging about 35 homes in this area. The homes were apparently built on a prehistoric landslide, a portion of which was reactivated due to degrading of the steep headscarp, possibly as the result of extant ground water accumulated during the unusually heavy 1978 spring rains. (Photo courtesy of City of Laguna Beach.)

2. Sacramento

The Sacramento District Office, located at 2815 "O" Street in Sacramento, provides geologic services to 30 counties in central inland and northeastern California. In addition, this District office provides geophysical and seismological services to the entire State.

District efforts have focused on studies of crustal deformation and seismicity. One important goal of these studies is the identification of precursors to damaging earthquakes so that an earthquake-warning system can be developed. Geological work has emphasized mineral resources and the evaluation of environmental considerations in land development.

The staff headquartered in the Sacramento District office on June 30, 1979 consisted of 13 geologists, 2 engineering geologists, 3 geophysicists, 5 seismologists, 3 geologic aids, 3 secretaries, 1 geologic drafting technician, and 1 permanent-intermittent secretary. In addition the District had the services of several student assistants and volunteers during the fiscal year 1978-1979.

3. San Francisco

The San Francisco District Office, which has been housed in the historic Ferry Building since 1896, covers a working territory of 17 counties in northern and central California. This includes approximately two-thirds of the California seacoast, most of the central and northern Coast Ranges, and much of the very active San Andreas fault and related faults.

Several Division-wide facilities exist in this District office. They are the geochemical laboratory, which provides analytical and testing support to the Division staff; the map room, in which are compiled and prepared various maps such as the Geologic Map of California series; the Division's large and complete technical reference library; and one of the largest mineral exhibits on the west coast.

Investigations and studies conducted from this office during fiscal year 1978-79 included cooperative geologic investigations with Santa Clara and Sonoma Counties, fault evaluation studies under the Alquist-Priolo Special Studies Zones program, classification of lands for mineral potential under the Surface Mining and Reclamation Act (SMARA), compilation of the first of a new series of 1:250,000 geologic maps of California, and the COSUNA project involving the preparation of stratigraphic sections at many locations in California.

Authorized District staff on June 30, 1979 consisted of 16 geologists, 1 geochemist, 1 geochemist-soil mineralogist, 2 laboratory technicians, 2 geologic aids, 3 geological drafting technicians, 1 librarian, 5 secretaries and clerks, and 1 janitor. During the year, use was made of volunteers and student assistants, and at year's end, not all of the authorized positions were filled.

II. Personnel Permanent Division Staff Members, June 30, 1979

Working Title (Classification)	Employee	Functional Association
<u>Headquarters Office</u>		
State Geologist	James F. Davis	Administration

Chief Deputy State Geologist	Thomas E. Gay, Jr.	Administration
Special Programs Officer (Supervising Geologist)	Rudolph G. Strand	Administration
Executive Assistant ¹ (Supervising Engineer)	Robert D. Goodier	Administration
Advisory Services Officer (Supervising Geologist)	Perry Y. Amimoto	Administration
Geothermal Resources Officer (Senior Engineering Geologist)	Rober C. Martin	Geothermal Investigations
Publications Officer (Senior Geologist)	Robert Streitz	Publications Administration
Program Planning Officer (Staff Services Manager 1)	Zoe K. Mankoski	Planning and Administration
Technical Planning Officer (Associate Geologist)	David J. Beeby	Planning and Administration
Administrative Officer (Staff Services Analyst)	Valerie Campbell	Administration
Editor, California Geology (Associate Geologist)	Mary C. Woods	Publications
Geologist (Assistant Geologist)	William A. Bryant	Publications
Geologic Aid	Diane C. Pierzinski	Publications
Publications Supervisor	R. Merl Smith	Publications
Lead Draftsman (Senior Geological Drafting Technician)	Jeffrey O. Tambert	Publications
Draftsman (Geological Drafting Technician)	Dorothy Y. Fong	Publications
Draftsman (Geological Drafting Technician)	Edward L. Foster	Publications
Graphic Artist	Ronald L. Morgan	Publications, SMARA and Alquist-Priolo
Drafting Aid (Drafting Aid II)	Louise Huckaby	Publications, SMARA and Alquist-Priolo
Secretary to State Geologist (Secretary I)	Mary L. Burgess	Headquarters support

Management Services Technician	Beverly M. Rhodes	Headquarters support
Editorial Aid	Jon C. Lloyd	Publications
Editorial Aid	Margaret W. Turner	Publications
Stenographer	Miriam E. Moreland	Headquarters support
Office Assistant II (Type)	E. Molly Goldberg	Headquarters support
Publications Secretary (Office Assistant II--Type)	Carol A. Hendrickson	Publications
Receptionist (Office Assistant II--Type)	Deborah L. Roemer	Headquarters support

¹Assigned to Division from the Department of Conservation

Los Angeles District Office

District Geologist (Supervising Geologist)	Cliffton H. Gray, Jr.	Administration
Assistant District Geologist (Senior Geologist)	F. Harold Weber, Jr.	Administration, Fault investigations
Minerals Officer (Senior Geologist)	Paul K. Morton	(Santa Ana) Minerals and SMARA Land classification
Manager, Coastal and Marine Geology (Senior Marine Geologist)	Michael P. Kennedy	(San Diego) Fault investigations coastal development
Manager, Orange Co. Ground Response Project (Petroleum Geologist)	Edward C. Sprotte	Ground response investigations
Geologist (Associate Geologist)	Thomas P. Anderson	SMARA land class- ification
Geologist (Associate Geologist)	Allan G. Barrows	Fault investigations
Geologist (Associate Geologist)	Robert L. Hill	Fault investigation

Geologist (Associate Geologist)	James E. Kahle	Fault investigation
Technical Information Officer (Associate Geologist)	Edmund W. Kiessling	Information
Geologist (Associate Geologist)	Russell V. Miller	(Santa Ana) SMARA land classification
Geologist (Associate Geologist)	Richard B. Saul	Alquist-Priolo fault evaluation
Geologist (Associate Geologist)	Siang S. Tan	(Santa Ana) Advisory services
Geologist (Assistant Geologist)	Marjorie M. Bushnell	Trona NURE project
Geologist (Assistant Geologist)	David R. Fuller	Ground response investigation
Geologist (Assistant Geologist)	Richard B. Greenwood	Ground response investigation
Geologist (Assistant Geologist)	Jerome A. Treiman	Advisory Services
Geologic Aid	Jack L. McMillan	Information
Lead Draftsman (Senior Geological Drafting Technician)	Elizabeth M. Lindgren	Publications
Draftsman (Geological Drafting Technician)	Victor A. Protasov	Publications
Secretary to District Geologist (Office Technician--Type)	Wilma B. Ashby	Information and District support
Secretary to Minerals Offices (Stenographer)	Bernice H. Browne	(Santa Ana) Minerals support
Senior Account Clerk	Venice Huffman	District support
Office Assistant II (Type)	Brenda A. Ryder	District support
Office Assistant II (Type)	Sue Torres	District support

Sacramento District Office

District Geologist (Supervising Geologist)	John T. Alfors	Administration
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Assistant District Geologist (Senior Geologist)	C. Forrest Bacon	Geologic investigations and EQ precursors
Manager, Geophysical Studies (Senior Geologist, Geophysicist)	Rodger H. Chapman	Geophysical investigations
Manager, Seismologic investigations (Senior Seismologist)	Roger W. Sherburne	Seismological investigations
Geologist (Associate Engineering Geologist)	Elgar E. Stephens	Advisory services
Geologist (Associate Engineering Geologist)	Dennis L. Olmstead	Geothermal investigations
Geologist (Associate Geologist)	John L. Burnett	Geologic studies
Geologist (Associate Geologist)	William B. Clark	Minerals program
Geologist (Associate Geologist)	John S. Rapp	Minerals program
Geophysicist (Associate Geophysicist)	John H. Bennett	Geophysical investigations
Geophysicist (Associate Geophysicist)	Gordon W. Chase	Geophysical investigations
Seismologist (Associate Seismologist)	Chris H. Cramer	Seismological investigations
Seismologist (Associate Seismologist)	Lalliana Maulchin	Seismological investigations
Seismologist (Associate Seismologist)	Charles R. Real	Seismological investigations
Seismologist (Associate Seismologist)	Tousson R. Topozada	Seismological investigations
Geologist (Assistant Geologist)	Quintin A. Aune	Geologic studies
Geologist (Assistant Geologist)	Stephen P. Bezore	Geologic studies
Geologist (Assistant Geologist)	Chris T. Higgins	Geothermal investigations

Geologist (Assistant Geologist)	Allen Lynn Jones	Advisory services
Geologist (Assistant Geologist)	Susan B. Kohler	Advisory services
Geologist (Assistant Geologist)	Eddie Leivas	Advisory services
Geologist (Assistant Geologist)	Ralph C. Loyd	Minerals program
Geologist (Assistant Geologist)	Gary C. Taylor	Geologic studies
Geologist (Assistant Geologist)	Leslie G. Youngs	Geothermal investigations
Geologic Aid	Gordon L. Campbell	Geological investigations
Geologic Aid	Ernest C. Durrwachter	Geologic studies
Geologic Aid	David L. Parke	Seismologic investigations
Draftsman (Geological Drafting Technician)	Richard T. Boylan	Publications
Secretary to District Geologist (Senior Stenographer)	Yukie Ota	District support
Office Assistant II (Type)	Juanita G. Blodgett	District support
Office Assistant II (Type)	Danielle P. Riordan	District support

Sacramento, Office of Strong Motion Studies

Chief, Office of Strong Motion Studies (Senior Geologist)	Tom M. Wootton	Strong motion instrumentation and data processing
Operations Manager (Senior Structural Engineer)	John T. Ragsdale	Strong motion instrumentation
Seismologist (Associate Seismologist)	Lawrence D. Porter	Strong Motion instrumentation
Geologist (Assistant Geologist)	Richard D. McJunkin	Strong motion instrumentation
Lead, Building Installations (Civil Engineering Technician II)	Milton J. Seaton	Strong motion instrumentation

Lead, Instrument Development (Precision Electronic Specialist)	Albert G. Guyer	Strong motion instrumentation
Strong-Motion Serviceman (Seismological Instrument Technician II)	Harry P. LaGesse	Strong motion instrumentation
Strong-Motion Instrumentman (Seismological instrument Technician II)	Charles E. Luzier	Strong motion instrumentation
Installer (Seismological Instrument Technician II)	Wayne W. Williams	Strong motion instrumentation
Lead, Installation (Seismological Instrument Technician I)	Marvin M. Huston	Strong motion instrumentation
Staff Serviceman (Seismological Instrument Technician I)	Thomas McGrady, Jr.	Strong motion instrumentation
Lead Serviceman (Seismological Instrument Technician I)	Charles D. Turpen	Strong motion instrumentation
Installation Aid (Seismological Instrument Aid)	Claudia L. Hallstrom	Strong motion instrumentation
Installation Aid (Seismological Instrument Aid)	Robert J. Meneely, Jr.	Strong motion instrumentation
Installation Aid (Seismological Instrument Aid)	Vicki L. Steeves	Strong motion instrumentation
Secretary (Office Assistant II--Type)	Vernettia G. Syphax	Support
Office Assistant II (Type)	Jill Mayne	Support

San Francisco District Office

District Geologist (Supervising Geologist)	Richard M. Stewart	Administration
Assistant District Geologist (Senior Geologist)	Charles C. Bishop	Administration basic geology and geologic hazards

Manager, Alquist-Priolo Special Studies Zoning, Fault evaluation (Senior Geologist)	Earl W. Hart	Alquist-Priolo Special Studies Zones
Manager, Regional Mapping (Senior Geologist)	Charles W. Jennings	Regional geologic mapping and compila- ion
Geologist (Associate Geologist)	Charles F. Armstrong	Geologic hazards
Geologist (Associate Geologist)	Frederic R. Kelley	Advisory services
Geologist (Associate Geologist)	Richard T. Kilbourne	Advisory services
Geologist (Associate Geologist)	Salem J. Rice	Advisory services
Geologist (Associate Geologist)	Trinda B. Ristau	Regional geologic mapping
Geologist (Associate Geologist)	Drew P. Smith	Alquist-Priolo fault evaluations
Geologist (Associate Geologist)	Melvin C. Stinson	SMARA land classification
Geologist (Associate Geologist)	David L. Wagner	Regional geologic mapping
Manager, Geochemical Laboratory (Associate Geochemist)	Hasmukhrai H. Majmundar	Geochemical invest- igations
Geologist (Assistant Geologist)	Edward J. Bortugno	Geologic studies
Geologist (Assistant Geologist)	Michael W. Manson	SMARA land classification
Laboratory Technician	Charles B. Smith	Geochemical invest- igations
Geologic Aid	James G. Moreno	Alquist-Priolo
Geologic Aid	George J. Saucedo	Basic geology compilations
Lead Drafstman (Senior Geological Drafting Technician)	Richard R. Moar	Publications

Draftsman (Geological Drafting Technician)	Donald R. Anderson	Publications, SMARA and Alquist-Priolo
Draftsman (Geological Drafting Technician)	Marilee B. Bailey	Publications, SMARA and Alquist-Priolo
Librarian	Angela Brunton	Information
Secretary to District Geologist (Senior Stenographer)	Josephine Territo	District support
Office Technician (General)	Eleanor M. Learned	Information
Stenographer	Delores Patterson	District support
Laboratory Assistant	Janice Broxton	Geochemical investigations
Secretary (Office Assistant II--Type)	Dorothy L. Hamilton	Regional mapping support
Office Assistant II (Type)	Lori R. Sargis	District support
Janitor	Andrew C. Love	District support

Assigned to Department of Forestry

Senior Geologist	Carl J. Hauge	Sacramento (attached to Head- quarters) Soil erosion investigations
Geologist (Associate Geologist)	Oscar L. Huber	Eureka (attached to S.F. District) Timber harvest plan review
Geologist (Associate Geologist)	Michael E. Huffman	Santa Rosa (attached to S.F. District) Timber harvest plan review

Temporary Staff

Glenn A. Borchardt	Associate Geochemist - Soil Mineralogist	San Francisco: Geologic hazards
Shirley A. Rowley	Stenographer	Headquarters: Advisory services Secretary
Irene Turner	Office Assistant II (Type)	Sacramento: District support

Maria G. Salinas	Seasonal Clerk	Sacramento: District support
Bruce A. Hitchman	Graduate Student Assistant	Los Angeles: Geothermal
Phillip A. Levine	Graduate Student Assistant	Los Angeles: Geothermal
David R. Smith	Graduate Student Assistant	Los Angeles: Geologic investigations
Woody C. Sutherland	Graduate Student Assistant	San Diego: Special investigations
Sharon L. Amlin	Student Assistant	Sacramento: Seismological support
Sharon L. Anderson	Student Assistant	Sacramento: Seismological support
Dennis N. Chudacoff	Student Assistant	Sacramento: Seismological support
Suzanne D. Huntley	Student Assistant	Sacramento: Seismological support
Scott L. Keck	Student Assistant	Sacramento: Seismological support
Kenneth R. Lemley	Student Assistant	Sacramento: Seismological support
Katherine McDowell	Student Assistant	San Francisco: Regional mapping
Marla S. Partin	Student Assistant	San Francisco: Information support
Daniel Sabatino	Student Assistant	Sacramento: Seismological support
Bahram Badie	Volunteer	Sacramento: Seismological support
Douglas H. Balding	Volunteer	Sacramento: Geophysical investi- gations
Michael Burns	Volunteer	Sacramento: Geological field studies
Kenneth Carlson	Volunteer	Sacramento: Seismological support

Gail Donoghue	Volunteer	Sacramento: Seismological support
Pete Froeberg	Volunteer	Sacramento: Seismological support.
Shawnee L. Hannah	Volunteer	Sacramento: Geothermal investi- gations
John R. Hawk	Volunteer	Sacramento: Geothermal investi- gations
Mike Kozuch	Volunteer	Sacramento: Seismological support
Randolph J. Lieb	Volunteer	Sacramento: Seismological support
Lydia Lofgren	Volunteer	San Francisco: Geological investi- gations
Polly A. Lowry	Volunteer	Sacramento: Seismological support
David H. Peterson	Volunteer	San Francisco: Geological investi- gations
John E. Romie	Volunteer	Sacramento: Seismological support
Paul S. Rosenberg	Volunteer	Sacramento: Geothermal investi- gations
Michael A. Silva	Volunteer	Sacramento: Mineral studies
Marianne Stam	Volunteer	San Francisco: Geological investi- gations
David J. Thormahlen	Volunteer	San Francisco: Geological investi- gations
William O. Ward	Volunteer	San Francisco: Geological investi- gations
Linda K. Withrow	Volunteer	Sacramento: Seismological support

Ron Young

Volunteer

Geochemical investigations

Employees hired

Marilee B. Bailey	Geological Drafting Technician
Juanita G. Blodgett	Office Assistant II (Type)
Janice Broxton	Laboratory Assistant
Bernice H. Browne	Stenographer
Valerie Campbell	Staff Services Analyst
Richard Corbaley	Assistant Geologist
Suzanne L. Cross	Senior Stenographer
Richard B. Greenwood	Assistant Geologist
Carol A. Hendrickson	Office Assistant II (Type)
Oscar L. Huber	Associate Geologist
Louise Huckaby	Drafting Aid II
Allen Lynn Jones	Assistant Geologist
Susan L. Kohler	Assistant Geologist
Jon C. Lloyd	Editorial Aid
Jill Mayne	Office Assistant II (Type)
Richard D. McJunkin	Assistant Geologist
Jack R. McMillan	Geologic Aid
Robert J. Meneely, Jr.	Seismological Instrument Aid
Dennis L. Olmstead	Associate Engineering Geologist
Diane C. Pierzinski	Geologic Aid
Deborah L. Roemer	Office Assistant II (Type)
Lori L. Sargis	Office Assistant II (Type)
Barbara J. Schroeder	Office Assistant II (Type)
Vicki L. Steeves	Seismological Instrument Aid
Elgar E. Stephens	Associate Engineering Geologist
Leslie G. Youngs	Assistant Geologist

Employees promoted

Claudia L. Hallstrom	Seismological Instrument Aid
Marvin M. Huston	Seismological Instrument Technician I
Richard T. Kilbourne	Associate Geologist
Harry P. La Gesse	Seismological Instrument Technician II
Elizabeth M. Lindgren	Senior Geological Drafting Technician
Charles E. Luzier	Seismological Instrument Technician II
Zoe Z. Mankoski	Staff Services Manager I
Roger C. Martin	Senior Engineering Geologist
Thomas McGrady, Jr.	Seismological Instrument Technician I
Victor A. Protasov	Geological Drafting Technician
Shirley A. Rowley	Stenographer
Drew P. Smith	Associate Geologist
Jeffrey O. Tambert	Senior Geological Drafting Technician
Charles D. Turpen	Seismological Instrument Technician I
Wayne W. Williams	Seismological Instrument Technician II

Employees separated

Judith Bentzien	Senior Stenographer	Transferred
Charles Chesterman	Senior Geologist	Retired
George B. Cleveland	Senior Geologist	Retired
Richard Corbaley	Assistant Geologist	Transferred
Suzanne L. Cross	Senior Stenographer	Transferred
Jeanne Holmes	Stenographer	Transferred
Judith A. Klisch	Office Assistant II (Type)	Transferred
Melinda S. Lackey	Editorial Aid	Resigned
Marianne Leach	Library Technical Assistant	Transferred
Marianne Roja	Office Assistant II (Type)	Transferred
Barbara J. Schroeder	Office Assistant II (Type)	Resigned
Robert Switzer	Geological Drafting Technician	Resigned
David A. Thomas	Office Assistant II	Resigned
Betty E. Van Den Berg	Stenographer	Transferred
Rodney K. Wong	Drafting Aid II	Resigned

III. Interagency activities

The Advisory Services Group has contractual agreements with the following state agencies: the Energy Commission, the Department of Forestry, the Coastal Commission, the Public Utilities Commission, and the Office of the State Architect.

The Advisory Services Group also participated in the Geotechnical Subcommittee of the State Safety Board, the Ad-Hoc Hospital Act Committee of the Seismic Safety Commission, the State Task Force on Nuclear Materials and Radioactive Materials, and the Resources Agency Task Force on Outer Continental Shelf.

IV. Budget Summary

Expenditures by Program Component

Geologic Hazards and Mineral Resources Conservation Program

	<u>Personnel Years</u>	<u>Dollars</u>	<u>Personnel Years</u>	<u>Dollars</u>
Land Use Geology and Seismology				
Element			75.9	2,828,478
Basic Investigations				
Component	17.4	\$ 648,426		
Hazards Reduction				
Component	58.5	2,180,052		

Mineral Resources Conservation			
Element		21.6	804,942
Deposit Inventory			
Component	11.1	413,650	
Land Classification			
Component	9.5	354,026	
Mined Land Reclamation			
Component	1	37.266	
Geologic Information and			
Publication Element		21.5	801,216
Information Component	8.9	331,666	
Publications Component	12.6	469,550	
Administration Element		<u>30.5</u>	<u>970,921</u>
	<u>TOTAL EXPENDITURES</u>	<u>149.5</u>	<u>5,405,557</u>

Source of Funds

General Fund	3,568,315
State Highway Account, State Transportation Fund	11,400
California Water Fund	11,400
Strong-Motion Instrumentation Program Fund	877,703
Federal Funds	535,760
Reimbursements	<u>400,979</u>
TOTAL	<u>5,405,557</u>

V. State Mining and Geology Board

The State Mining and Geology Board is a nine-member board. Each member is appointed by the Governor to serve a four-year term. The Governor designates the chairman, who shall hold such office at the Governor's pleasure. The vice-chairman is elected annually.

The Board's responsibilities, as stated in Sections 672-677 of the Public Resources Code, are as follows:

"The Board shall represent the state's interest in the development, utilization, and conservation of the mineral resources of the state and the reclamation of mined lands, as provided by law, and federal matters pertaining to mining, and shall determine, establish, and maintain an adequate surface mining and reclamation policy. The Board shall also represent the state's interest in the development of geological information necessary to the understanding and utilization of the state's terrain, and information pertaining to earthquake and other geologic hazards. General policies for the Division shall be determined by the Board.

"The Board shall also serve as a policy and appeals board for the purposes of the Alquist-Priolo Special Studies Zones Act (Chapter 7.5, Division 2, Public Resources Code).

"On or before December 31 of each year, the Board shall submit to the Governor and the Legislature recommendations regarding needed research projects relating to the state's terrain, mineral resources, mining, the reclamation of mined lands, and earthquakes and other geologic hazards.

"The Board may provide for a statewide program of research regarding the technical phases of reclaiming mined lands which may be delegated to it by law and may accept funds from the United States or from any person to aid in carrying out the provisions of this section. The Board may conduct such a program independently or by contract or in cooperation with any person, public or private organization, federal agency, or state agency, including any political subdivision of the state.

"The Board shall provide for a public information program on matters involving the state's terrain, mineral resources, mining, the reclamation of mined lands, and earthquakes and other geologic hazards."

"In accordance with the State Civil Service Act, the Board shall nominate, and the director shall appoint, . . . the State Geologist . . ."

1. Regular business meetings

The Board met to conduct business or hold public hearings as follows:

Sept. 29, 1978	Mission Hills
Nov. 2, 1978	Pasadena
Dec. 1, 1978	San Francisco
Jan. 31, 1979	Sacramento
Mar. 2, 1979	San Francisco
Mar. 16, 1979	Sacramento
April 28, 1979	Barstow
May 25, 1979	Sacramento

2. Field trips

Sites of surface faulting and structural damage associated with the 1971 San Fernando Valley earthquake were visited by Board members on September 28, 1978, to determine the adequacy of its guidelines in both identifying areas underlain by active faults and in assuring that structures for human occupancy are not placed in such areas. These guidelines were developed pursuant to the Alquist-Priolo Special Studies Zones Act.

The Board visited the Barstow area in April 1979 to observe the potential for mined lands reclamation in the desert. Two operating mines (NL Industries' Hectorite mine and the Blue Star gold mine) and American Smelting & Refining Company's Waterloo Project, low-grade silver deposit were toured. Operators at these sites discussed future reclamation plans with the Board. Visual impacts, dust generation, and reestablishment of vegetative habitat appeared to be the principal reclamation-related problems associated with these operations.

3. Major Board actions

a. Guidelines for classification and designation of mineral lands

On June 30, 1978, the Board adopted "Guidelines for Classification and Designation of Mineral Lands" pursuant to Section 2761 of SMARA. These guidelines implement SMARA by providing direction to the State Geologist in carrying the classification for mineral potential of lands in California that are threatened by uses which would be incompatible with, or would preclude, mining. These guidelines establish procedures by which the Board may designate mineral-bearing areas of statewide or of regional significance. The objective of the classification-designation process is to insure, through appropriate lead-agency policies and procedures, that mineral deposits of statewide or of regional significance are available when needed.

b. Classification of mineral lands

Classification of the San Fernando Valley Region, Los Angeles area, was submitted by the State Geologist and accepted by the Mining and Geology Board on May 25, 1979. This report identifies sand and gravel deposits needed to supply projected 50-year needs of the region.

This is the first formal classification accepted under the Board's guidelines. It is precedent-setting, both from the standpoint of its scientific methodology, and from its being the first in a series of classifications now in process in the Los Angeles and San Francisco metropolitan areas.

c. Classification and designation petitions

The Board recognizes the mineral potential of such non-urban areas of the State as the Mojave Desert, Sierra Nevada, and the Klamath Mountains and the need for a process to protect significant mineral deposits in these areas from land uses incompatible with mining.

These areas have potential for major gold, nickel, and tungsten production as well as containing important sources of boron, rare earths, iron, limestone for cement, and gypsum. Classification of these areas, according to the Board's revised priorities, will not occur on an extensive basis for at least five years.

The Board's Guidelines for Classification and Designation of Mineral Lands provide for what amounts to a spot procedure for classification and designation of significant mineral deposits in these and other non-urban areas by a petition process.

This provision was later expanded into Guidelines for Classification-Designation Petitions, which provides further criteria for consideration of a petitioned deposit and its priority for classification. The petition guidelines were adopted on July 12, 1979.

d. Petition for mineral lands classification

A petition submitted by Pfizer Corporation for classification of limestone deposits in the Lucerne Valley was accepted by the Board on May 25, 1979. These deposits are important sources of limestone for industrial use and are being threatened by urbanization in the Valley.

It is anticipated that the State Geologist and the CDMG will proceed with classification of these deposits prior to June 30, 1980.

e. Lead agency compliance with SMARA

SMARA does not specify dates for operator or lead-agency compliance beyond requiring that surface mining done after January 1, 1976, be conducted under an approved reclamation plan if it was an existing operation with vested rights, or under a permit and reclamation plan if it was a new operation. The Board, in its state policy for surface mining and reclamation practice, established a compliance date by requiring that operators of existing mines submit reclamation plans to lead agencies by April 28, 1978. Indirectly, this policy required that each lead agency adopt an ordinance in conformance with SMARA prior to that date.

A June 1979 canvass, made in preparation for Board action against non-complying lead agencies, indicated that of the 69 identified lead agencies, 12 counties and 3 cities had not adopted ordinances in conformance with SMARA.

Following the June canvass, the Board wrote to non-complying lead agencies, indicating that further inaction in adopting an ordinance in conformance with SMARA places existing surface mine operators in legal jeopardy. An operator cannot comply with the Act in the absence of an implementing ordinance. In addition, the lead agency cannot issue valid permits for new, surface mining operations.

The Board also requested from these lead agencies a written response as to when adoption of their SMARA ordinance is anticipated and as to the status of mine operator notification and reclamation plan submittal.

f. SMARA's applicability to federal lands

The Board took the position, on April 22, 1978, that SMARA applies to all lands in California, including federal lands. This was done to insure that regulations governing surface mining and reclamation practice are applied as uniformly as possible throughout the state and to minimize unnecessary duplication of such regulations by local, state and federal agencies. This position is in accord with Opinion SO 76/14 June 29, 1977 of the Attorney General of California.

In support of these objectives, a memorandum of understanding between the Resources Agency, the U.S. Forest Service, and the U.S. Bureau of Land Management, which was developed under the State Mining and Geology Board's auspices, was signed in February 1979. This agreement provides for cooperation between local, state, and federal land-managing agencies in fulfilling their respective regulatory responsibilities for surface mining and reclamation. This understanding also provides for the mutual acceptance by local governments (lead agencies) and federal agencies of each agency's

reclamation plans, mining operation plans, and environmental documents when they meet individual agency regulatory requirements. It is hoped that this understanding will help avoid, or greatly reduce, duplication of effort by mine operators and regulatory agencies in assuring that mineral extraction is conducted in an environmentally acceptable manner.

g. Guidelines for mineral resource management

To aid local government in their implementation of the mineral resource conservation requirements of SMARA, the Board adopted "Guidelines for Mineral Resource Management" on May 25, 1979. These guidelines suggest goals and policies for use by local government to protect and assure the wise use of identified mineral resources. Land uses which are compatible and incompatible with mining also are defined.

h. Alquist-Priolo Special Studies Zones Act (APSSZA)

In response to recommendations from a joint subcommittee of the Seismic Safety Commission and Mining and Geology Board, revisions of the Board's APSSZA Policies and Criteria were developed and adopted following a public hearing on January 31, 1979. These recommendations clarified the Board's Policies and Criteria and their application to projects proposed for zones of active faulting as identified by the State Geologist.

Pursuant to Section 2622 of APSSZA, and to the Board's Procedures for Review of Special Studies Zones (SSZ) Maps adopted August 11, 1978, the Board reviewed the following preliminary SSZ maps (USGS 7 1/2 minute quadrangle sheets):

Ventura	Burbank
Saticoy	Mt. Baldy
Del Sur	Cucamonga Peak
Sleepy Valley	Yucaipa
Ritter Ridge	La Habra
Palmdale	San Francisco
Sunland	

These maps were transmitted with comments by the Board to the State Geologist for issuance as Official SSZ maps.

4. Membership of the Board

BOARD MEMBER	CURRENT TERM (Expires January 15)	FIRST APPOINTED	SPECIALTY (As required by Public Resources Code, Sec.662)
ROBERT H. TWISS (CHAIRMAN) 410 Yale Street Kensington, CA 94708	1976-1978	1976	Landscape architect: soil conservation or revegetation (University of California, College of Environmental Design, Dept. of Land- scape Architecture)

JAMES A. ANDERSON Vice President Homestake Mining Company 650 California Street San Francisco, CA 94108	1976-1981	1978	Registered geologist: mining geology (Homestake Mining Co.)
ALCIDES S. FREITAS 5510 Linda Lane Carmichael, CA 95806	1978-1981	1976	Environmental protection (Sacramento County Office of Environmental Management)
WILLARD P. FULLER, JR. P.O. Box 745 San Andreas, CA 95249	1978-1981	1976	Mining engineer: mining minerals in California (Calaveras Cement Co.)
ARTHUR GRANTZ (VICE CHAIRMAN) 380 Olive Street Menlo Park, CA 94025	1976-1979	1976	Mineral resource (U.S. Geological Survey)
RAYMOND E. KRAUSS 6969 St. Helena Road Santa Rosa, CA 95404	1978-1979	1978	Local government representative: urban planning (Sonoma County Planning Department)
RETURN F. MOORE President, Moore & Taber 4530 East La Palma Avenue Anaheim, CA 92807	1976-1980	1976	Registered civil engineer; soil engineering (Moore & Taber)
TA-LIANG TENG Professor of Geophysics Department of Geological Sciences University of Southern California University Park Los Angeles, CA 90007	1976-1980	1976	Registered geophysicist: seismology (USC)
VACANCY			Non-specialized experience

VI. Statutory Authority for the Division

The Division of Mines and Geology operates under the authority provided in the State Public Resources Code, significant parts of which are summarized as follows:

Division 1. Administration

Chapter 2. Department of Conservation

Article 1. Organization and general powers

Section 601. Established the Department of conservation in the Resources Agency and identifies the role of the Director.

Section 607. The work of the Department is divided into three divisions, known as the Division of Mines and Geology, Division of Oil and Gas, and the Division of Resource Conservation.

Article 3. State Mining and Geology Board

Sections 660 -676. Establishes the Board and its responsibilities.

Section 677. The Board shall nominate and the Director shall appoint the State Geologist. Describes the qualifications of the State Geologist.

Section 678. Provides the authority of the State Geologist.

Division 2. Geology, Mines, and Mining

Chapter 2. The Division of Mines and Geology

(Sections 2201-2209 inclusive)

Section 2201. State Geologist shall employ geologists and qualified specialists to do Division's work.

Section 2203. State Geologist shall submit an annual report, including review of measures taken to counter geologic hazards, and review of economic utilization and conservation of State's mineral resources and problems related thereto, pursuant to the State Mining and Minerals Policy (Section 2650).

Section 2204. State Geologist may receive and manage gifts on behalf of State.

Section 2205. State Geologist may: Study mineral resources, mineral industries, and geology of the state; Collect mineral statistics; Collect geological and mineralogical specimens and models to constitute Division's exhibits; Provide technical library to be Division's library; Maintain, in effect, a bureau of information on the State's mineral industries; Conduct studies of geologic hazards in urban areas, including activities under cooperative agreements; Maintain a laboratory to perform physical and chemical tests and analyses; Issue reports and maps on the geology of the State and the statistics and technology of the State's

mineral industries; Conduct investigations in mining and metallurgy, including use of scrap mineral products, and in land-use practices applicable to mineral resources conservation; Conduct investigations in reclamation and utilization of mining waste products and reclamation of mined lands.

Section 2207. Mineral producers shall forward to the State Geologist, upon his request, annual mineral production figures. Such reports shall be confidential. State Geologist shall compile and publish statistical bulletins to show totals of minerals produced, annually.

Section 2207.1 Manufacturers or processors may, upon request, report to the State Geologist data on consumption or utilization of mineral materials. Such reports shall be confidential.

Section 2209 State Geologist may fix prices upon and dispose to the public all publications of the Division.

Chapter 7.5. Special Studies Zones
(Sections 2621 - 2630 inclusive)

Section 2622. State Geologist shall delineate Special Studies Zones to encompass potentially and recently active faults under the Alquist-Priolo Special Studies Act. He shall continually review new geologic and seismic data and revise or issue new special studies zones when warranted by new information.

Chapter 7.6. State Mining and Minerals Policy

Section 2650. Establishes the State Mining and Minerals Policy and requires the State Geologist to carry out such policy. He may include in his annual report to the Director (Section 2203) recommendations for items of legislations necessary to implement such policy.

Chapter 8. Strong Motion Instrumentation Program (Sections 2700 - 2709 inclusive)

Establishes the strong-motion instrumentation program and describes the role of the Division of Mines and Geology in its implementation.

Chapter 9. Surface Mining and Reclamation Act of 1975 (Sections 2710 - 2793 inclusive)

Establishes the Surface Mining and Reclamation Act of 1975 to regulate surface mining operations. Identifies

the role of the State Geologist and the Mining and Geology Board. Requires the Board to adopt State policy for the reclamation of mined lands. Requires the State Geologist to classify lands as to their mineral potential.

VII. Recent Legislation

During 1978-79 the following measures of concern to the Division of Mines and Geology were enacted into law:

Assembly Joint Resolution 97,
Mello and others
Chapter 101

Memorializes Congress to provide for thorough analysis of resource potential and environmental impacts of OCS lease sale #53. Chaptered August 28, 1978.

Assembly Joint Resolution 61,
Keysor
Chapter 64

Memorializes Congress to provide adequate funding for Earthquake Hazard Reduction Act of 1977. Chaptered July 10, 1978.

AB2752, Wornum
Chapter 953

Amends general planning law to allow a city to adopt its county's seismic safety element as the city's own seismic safety element. Also, requires copy of each city and county seismic safety element, and technical data, be filed with Division of Mines and Geology. Approved by the Governor September 18, 1978; effective January 1, 1979.

SB1686, Alquist
Chapter 835

Provides for waiver of earthquake evaluation otherwise required for hospital alterations, when unnecessary; State Geologist (ex officio member of Hospital Building Safety Board) to participate in writing criteria for waivers. Approved by the Governor September 15, 1978; effective January 1, 1979.

SB1308, Alquist
Chapter 521

Requires that when Real Estate Commissioner is notified of intention to sell or lease, the notice include reference to any soils or geologic reports prepared specifically for the subdivision. Approved by the Governor August 24, 1978; effective January 1, 1979.

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